POLITECNICO DI MILANO

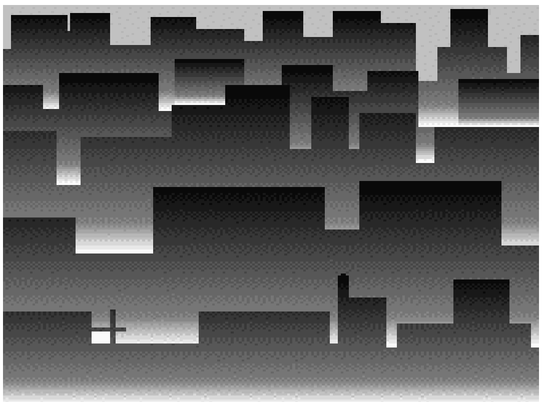
Dipartimento BEST
Scienza e Tecnologie dell'Ambiente Costruito
Building & Environment Science & Technology

DOTTORATO DI RICERCA TEPAC

TECNOLOGIA e PROGETTO PER L'AMBIENTE COSTRUITO
XXV ciclo

Işıl RUHİ

The Implications of the use of Building Environmental Assessment Tools within the Building Practice in Turkey



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A B S T R A C T

Ab

ABSTRACT

Researchers in the field of built environment have recently called for a shift in paradigm in designing from the current one framed by a mechanistic worldview to one informed by whole/living systems, that is, an ecological worldview. This call indicates the need of innovating ways of designing and ways of living. This is not an easy task since buildings and cities result from socio-technical systems guided by deep structures, sharing a number of systems of provision, such as energy, transportation, policy, and technology. Therefore innovation requires a systemic approach.

Despite these calls and the growing number of alternative design and assessment tools, a particular set of tools, developed based on a mechanistic worldview, appear to dominate the 'real' market. The building environmental assessment tools (BEATs), such as BREEAM, the Procedure HQE, and LEED, have significantly affected both the public and the market awareness and the perception of what a sustainable building is. Currently in Turkey, the future direction of sustainability in architectural design seems to rely on the abilities of LEED and BREEAM. Due to the lack of better alternatives, these tools are used as design guidelines, instead of their original objective as assessment of projects. Therefore the thesis intends to understand what the promise of these tools would be in steering us towards a new paradigm, possibly through a number of radical innovations which diverge from cognitive, regulatory, and normative rules of the context, both at the practice level and the socio-technical system of the built environment.

The thesis presents a critical review of BEATs based on a discussion of the contested nature of the concept of sustainability and the design principles of the ecological worldview. It then elaborates two heuristic models developed in middle-range theory called *Multi-Level Perspective (MLP)*, and *social practice theory* (SPT) to study the design practices framed by BEATs through qualitative analysis of six case study projects. To gain a holistic understanding of the appreciation of these tools in the field, the thesis also conducts a survey on two groups of professionals –those who worked on certified projects and those without prior experience.

The thesis first explores the use of BREEAM and LEED within the design practices of case study projects in Turkey through SPT to reveal how the architects accommodate their practice relative to BEATs and to examine whether these practices introduce radical innovations. Second, through the heuristic methodology provided by MLP, it investigates the influences of these tools in enabling major deep-structural changes in the building sector by underscoring the interactions between these niche practices and the regimes in the socio-technical system of built environment.

Based on the synthesis of these practices with BEATs, along with their interactions with the overarching regimes effective on the socio-technical system of built environment in Turkey, the thesis discusses the barriers in routine practices of design professionals that preclude making radical innovations in process. It suggests ways to develop new practices in the field of architecture and reveals the problems stemming from the application of international tools in Turkey. The study puts forth the importance of considering the structuring effects of socio-technical regimes while developing new practices for attaining sustainability in built environment and suggests new considerations for next generation assessment tools.

Keywords: Sustainability, building environmental assessment tools, mechanistic worldview, ecological worldview, regenerative paradigm, social practice theory, Multi-level perspective, Turkey

CONTENTS

T

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

I am truly grateful to my supervisors Prof. Niccolò ASTE and Prof. Lavinia Chiara TAGLIABUE for their guidance and the clarity they have brought to my understanding of the field. I especially value Prof. Lavinia Chiara TAGLIABUE's intellectual and emotional support throughout my thesis work, especially at points and times where I needed to get on track.

I am indebted to Prof. Gianfranco Minati for introducing me to field of systemics and opening my mind to a new worldview. I am very thankful to the faculty members at TOBB University of Economics and Technology, Department of Architecture, Prof. Nur Çağlar, Prof. Murat Gül, Prof. Figen Gül, and Prof. Hakan Sağlam for introducing me to the educational field of architecture and for their support throughout the development of the thesis.

I would certainly be remiss not to acknowledge the architects and assessors who agreed to participate in this study. I would like to thank all the respondents to the survey questionnaire. Without their efforts this thesis would not be possible.

I do not have enough words to express my gratitude to my parents Şükriye and Emin Ruhi, İnci and Saim Sipahioğlu, and my granparents Fatma and Recep Ünver for their continuous encouragement and support.

Finally, my one and only, Volkan Sipahioğlu, there are still no words that express what you mean to me… You were always there, relentlessly saying "change your point of view." This thesis is dedicated to you.

CHAPTER 1

INTRODUCTION

Over the past 100 years, industrial sector developments in medicine, materials, transportation, communication, and production, while shaping a new globalized world, have paved the way for an unprecedented economic human prosperity built upon a belief that Nature, including humans, can be treated as an endless source of resources and limitless depository for waste. David Orr in his speech delivered as the commencement address to the School of Design, University of Pennsylvania, succinctly summarized what has changed over the span of this century in four facts to be considered in architectural designs by students.[1]

(1) Human beings have increasingly become “an indoor species increasingly shut off from sky, land, forests, waters, and animals” with respect to the time spent in indoors (e.g. houses, cars, malls, and offices). This resulted in a disconnection from Nature that caused what Richard Louv calls “nature deficit disorder –the loss of our sense of rootedness in place and connection to the natural world.” Orr states that in the near future this would lead to in an unprecedented spiritual crisis, therefore this “has to do with the largeness of the human spirit and our capacity to connect to life.”[2]
(2) The growing human population from less than one billion to 6.5 billion, which is expect to reach 9 or 10 billion, has not only called into question the carrying capacity of the Earth, but has also become a problem of justice with respect to the growing ratio of richest to poorest now approaching 100:1. This aspect therefore “has to do with justice, fairness, and decency in a more crowded world.”[3]
(3) The society of this last century is said to be built on “the foundation of cheap portable fossil fuels.” In fact, the era of cheap of oil is likely to reach an end, and there is currently no coherent or farsighted energy policy. This fact is explained “to do with our wisdom and creativity in the face of limits to the biosphere.”[4]

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[1] *The Commencement Address to the School of Design, University of Pennsylvania, may 14, 2007,*
[2] Ibid.
[3] Ibid.
[4] Ibid.

(4) Over the last century (150 years), the level of CO_2 in the atmosphere has grown from 280 parts per million to 430 parts per million CO_2 equivalent, which represents the level of all human-generated heat-trapping gases. The mean temperature of Earth has risen by 0.8 ^{o}C and if no prevention is taken this would mean at least another 0.6 ^{o}C in the coming years. This rise does not only mean that we heat the Earth, but we also destabilize the entire planet, with respect to the extinction of animal species and warming up of oceans. Orr states that this fact is related with "human survival on a hotter and less stable and predictable planet."[5]

These problems are succinctly called by Glenn Murcutt as the lost of synch between human's time and Nature's time:

> So, the time of nature is her daily cycle, her seasonal cycle, the time of the phases of the moon, and the consequential tidal movements, the time it takes for a storm to develop, the clouds to gather, and then pass. This is nature's time. Human time once worked with nature's time, but no longer. Human time has over the last 60 years developed into accelerated time, and it is out of synch with nature's time. During this period of human time, there have been in architecture works that have shown brilliance, but such brilliance may not stand the test of time. Affluence, during this recent period of human time, has been unprecedented and greed has provided the disconnect between the rhythms of nature's time, and human time.[6]

Sustainable = "Long-lasting"

Thus nature cannot afford our footprint on earth anymore. The past 40 years has brought an increasing recognition of the repercussions of this new world, such as inequalities in the distribution of economic prosperity, environmental degradation, and loss of cultural diversity. This awareness has brought into scene the idea of survival, and then conceptualizing and discussing sustainability have become a global and mainstream phenomenon in a variety of fields such as, construction, transportation, agriculture, and education. Over this period, the word 'sustainability' has gained multi-layered conceptualizations and has drifted away from its limited meaning, that is, 'long-lasting.'

While still remaining elusive and controversial, "[t]he concept of sustainability has had an evolving past"[7] within this time span. Coupled with the diversity in professional interests and shifts in worldviews, over the years, the conceptualizations of sustainability and thus the strategies to 'attain' a sustainable world have undergone major revisions. Despite the diversities in approach, it is observed that the well-known definition of the term 'sustainable development' that first appeared in the Brundtland Report in 1987 as "[d]evelopment that meets the needs of the present without compromising the ability of further generations to meet their own needs,"[8] still remains central to discourses in many fields. In the nearly 25 years, critics have challenged several key elements of this report, "specifically alleging it capitulates to continued human development and

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[5] Ibid.
[6] Glenn Murcutt, "Presentation at Days of ORIS: Ankara" (Ankara, Turkey, TOBB University of Economics and Technology, 21 May, 2012).
[7] Raymond J. Cole, "Environmental Issues Past, Present and Future: Changing Priorities and Responsibilities for Building Design" (Helsinki, World Sustainable Building Conference, October, 18-21, 2011). Jay Yang, "Editorial: Promoting Integrated Development for Smart and Sustainable Built Environment," *Smart and Sustainable Built Environment* 1, no. 1 (2012), 4-13.
[8] World Commission on Main Concepts of Sustainable Design 1987, p. 46

emphasizes human needs at the potential expense of nonhuman environmental needs."[9] Nevertheless this definition still acts as a minimal benchmark for assessing the impact of human actions on earth. In fact, by including the role of our current actions on future needs, it establishes "the principle that people have the responsibility to consider others' needs—particularly future needs—in conjunction with their own needs."[10] Thus it put forwards the idea of considering communities, rather than adopting an individualistic perspective.[11]

The concept of sustainability in the field of architecture has also had an evolving past. While stepping into the academic and the professional scene often with contradictory ambitions advocating for diverse pathways for sustainability in architecture, the concept sustainability has gained paramount significance in architectural discourse. In fact, to reduce or even delete our footprint on earth, a considerable number of competing academic responses have been suggested based "on different ideals of scientific knowledge, different "epistemic" criteria, as well as different varieties of scientific practice."[12] The "[c]ontested nature of sustainability" has become one of the major debates in the field of architecture.[13] However we are currently in a situation where everybody is making, what Michel Foucault called, 'truth claims' on ways to develop sustainable designs based on diverse epistemic criteria and worldviews.[14] In fact it does not seem possible to keep up with the major problem that has brought forth this concept into scene: The crisis of perception triggered by an out-dated mechanistic/modernist worldview, which is related with "anthropocentric" worldview as well.[15]

Sustainability problems = "nature's time and humans' time is out of synch"

The current unsustainable built environment is explained to be the result of a crisis of perception (Capra 1995, pp.3-4)

Conceptualizations about the world are strongly tied to the dominant worldviews. Raymond J. Cole states that "our worldview shapes our values, theories and preconceptions and that these in turn determine the problems we perceive, the knowledge we seek and the actions we take."[16] Developments especially in the field of physics and biology, and then in systemics revealed that the mechanistic worldview gave a misrepresentation of the world. Through an anthropocentric approach to nature, this worldview deciphered world phenomena as a deterministic clockwork based on a Cartesian approach that can be analyzed and understood by the division of the whole into its parts. Gregory Bateson explained the impact of this worldview on our current condition concisely as follows:

Conceptualizations about the world are strongly tied to the dominant worldviews.

> "The major problems in the world are the result of the differences between the way nature works and the way people think."

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[9] Kim Tanzer and Rafael Longoria, "Introduction: Networked Ways of Knowing," in *The Green Braid: Towards an Architecture of Ecology, Economy, and Equity* (London: Routledge, 2007), 3.
[10] Ibid., 3
[11] Ibid., 3
[12] Andrew Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation* (Cambridge: Cambridge University Press, 2001), 27.
[13] Simon Guy, "Pragmatic Ecologies: Situating Sustainable Building," *Architectural Science Review* 53, no. 1 (2010), 22.
[14] Simon Guy and Steven Moore, "Sustainable Architecture and the Pluralist Imagination," *Journal of Architectural Education* 60, no. 4 (2007), 16.
[15] Fritjof Capra, "Deep Ecology: A New Paradigm," in *Deep Ecology for the Twenty-First Century*, ed. George Sessions (Boston, MA: Shambhala, 1995), 19-25.
[16] Cole, *Environmental Issues Past, Present and Future: Changing Priorities and Responsibilities for Building Design*, 6.

This difference in perception has actually prepared the ground for the lost of synch between human's time and Nature's time, and by consequence has induced sustainability problems. Furthermore, it has rendered human minds unable to comprehend the challenge of sustainability. While favoring notions such as simplicity, certainty and immediacy, it has "serve[d] to impede adaptive learning deemed essential for sustainability"[17]

Researchers have revealed that the world is not built upon such deterministic relationships that can be analyzed through the so-called part and whole division suggested by analytical thinking. The major problems of our times, as maintained by Capra, cannot be understood in isolation. "They are systemic problems, which means that they are interconnected and interdependent."[18] Current literature underscores that world phenomena are formed of networked elements, which have complex and nonlinear characteristics. Therefore it is maintained that sustainability can only be addressed through a holistic thinking that enables humans to conceive the world out of networked and connected elements. What lies underneath an ecologically sustainable path is a lifestyle realigned to a new conceptualization of the relationship between people and nature, based on ecological worldview. Capra illustrates the interconnectedness of world problems in the following 'conceptual map.'[19]

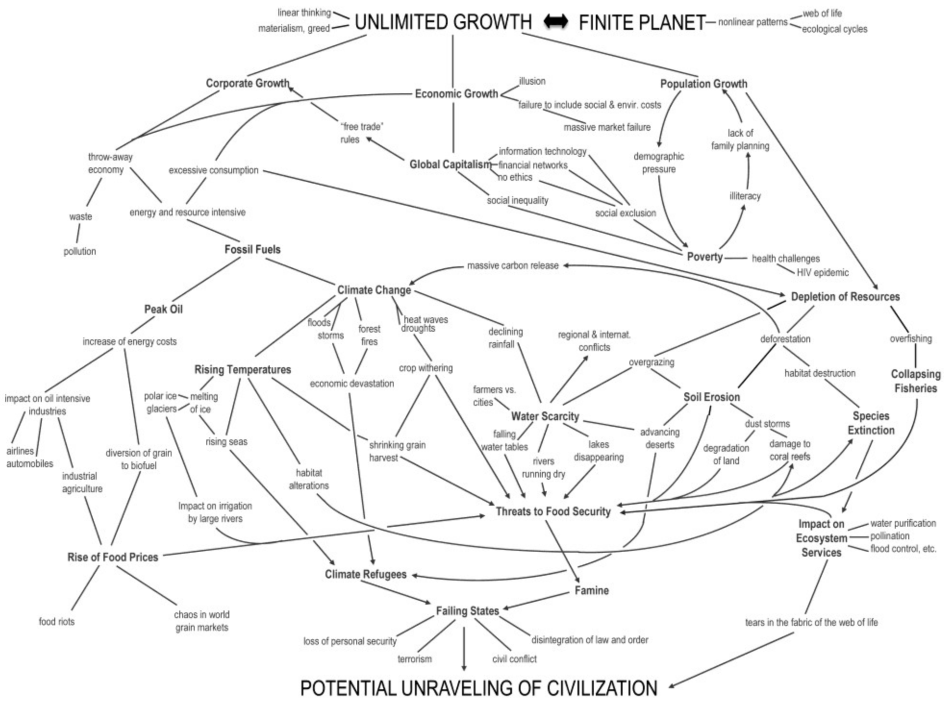

Fig. 1-1: Conceptual Map: Generated by Fritjof Capra.[20]

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[17] Thomas N. Gladwin, William E. Newburry and Edward D. Reiskin, "Why is the Northern Elite Mind Biased Against Community, the Environment, and a Sustainable Future?" in *Environment, Ethics, and Behavior: The Psychology of Environmental Valuation and Degradation*, eds. Max H. Bazerman and others (San Francisco, California: The New Lexington Press, 1998), 243.

[18] Capra, *Deep Ecology: A New Paradigm*, 3.

[19] Fritjof Capra, "Interconnectedness of World Problems: A Conceptual Map," www.earth-policy.org/images/uploads/capra_pb3.ppt (accessed January, 30, 2013).

[20] Ibid.

The mechanistic worldview has not only become the cause of current environmental, social, and economical problems, but has also become the guiding framework for researches that attempt to alleviate these problems. Without considering this synchronization – thus perception – problem, we observe that the old-dated worldview still acts as a key for mainstream prescriptions for sustainability. Instead of calling for a change in our practices, politics, or economics culpable of the present condition of the planet, these prescriptions "amount to a complex politics of cooptation that leaves intact the underlying framework of economics and the market that is inimical to nature in the first place."[21] What is essential however is the identification of the disease. It is maintained that researchers who focus narrowly on solutions are like doctors "who only prescribe and never diagnose."[22] The treatment of this disease foreseen through technological fixes without addressing the larger structure of ideas, worldviews, and paradigms that have brought us into the current situation, represents a short-sighted and inadequate attempt.[23]

As Albert Einstein noted, the "significant problems we face cannot be solved at the same level of thinking we were at when we created them." Therefore we have to change the worldview that has shaped this problem, thus the way we conceive world, which has caused our disconnect from nature, and which has for a considerable time guided how sustainability is defined and pursued in our field. Despite using diverse terminologies and starting points, over the past few years a broad range of researchers in the field of architecture converge on the need to change the worldview that has shaped "human intentions and that larger political, economic, and institutional structure that permitted ecological degradation."[24] Researchers call for a shift in paradigm from "the current one framed by a mechanistic worldview to one informed by a whole/living systems,"[25] thus an ecological worldview. They have already started to tackle design approaches based on such an aspired paradigm that foresees architectural design from a systemic context-specific and complexity-oriented approach.[26]

1.1 OVERVIEW

In the field of built environment, debates on sustainable architecture and cities are seen to be shaped "by different social and diverse agendas, based on different interpretations of the environmental challenge and characterized by different pathways, each pointing towards a range of sustainable futures."[27] Thus one can

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[21] Tania Katzschner, "Sustainable Architecture, Planning and Culture - Beyond the Mechanical and Unambiguous," *Human Settlements Review* 1, no. 1 (2010), 133.
[22] Ibid., 133
[23] Ibid.
[24] David Orr, "Architecture, Ecological Design, and Human Ecology," in *Green Braid: Towards an Architecture of Ecology, Economy, and Equity*, eds. Kim Tanzer and Rafael Longoria (Oxon: Routledge, 2007), 23.
[25] Chrisna Du Plessis and Raymond J. Cole, "Motivating Change: Shifting the Paradigm," *Building Research & Information* 39, no. 5 (2011), 437.
[26] Guy and Moore, *Sustainable Architecture and the Pluralist Imagination*, 15-23.; Tanzer and Longoria, *Introduction: Networked Ways of Knowing*, 3-14.; Chrisna Du Plessis, "Towards a Regenerative Paradigm for the Built Environment," *Building Research & Information* 40, no. 1 (2012), 7-22.
[27] Guy, *Pragmatic Ecologies: Situating Sustainable Building*, 21.

observe that no consensus based method has reached such a status to define a Kuhnian paradigm. However there seems to be one common agreement, and that is that we need to innovate our ways of doing. This agreement indicates the need of innovating ways of designing and lifestyles. This is not an easy task, since buildings and cities result from socio-technical systems guided by deep structures sharing a number of systems of provision, such as energy, transportation, policy, and technology. This means that the underlying framework of the socio-technical systems that permitted ecological degradation and that ceased the synch between human's time and nature's time should be innovated. Therefore innovation requires a systemic approach.

While calls for changing the paradigm within which we design and live is still ongoing, and while the field is putting ever new alternatives in the form of new tools, we must say a particular type of methodology is seen to be disseminating and dominating the 'real' market, which means those people who design and construct our built environment. While researchers are defining ideal types of methodologies in the form of assessments or design decision helping tools, probably none of them has reached such an audience as did the voluntarily based environmental or sustainability assessment tools. BRE Environmental Assessment Method (BREEAM), the Procedure HQE (La Démarche Haute Qualité Environnementale), and Leadership in Energy and Design (LEED), in regard to their appeal in marketing projects, have significantly affected the public awareness and perception of what a sustainable building is.[28]

1.1.1 WHY WE HAVE TO FOCUS ON ENVIRONMENTAL ASSESSMENT TOOLS?

By evaluating and making public the sustainable qualities of buildings, building environmental assessment tools aim at reducing the detrimental effects of construction practices on the natural environment. Since the 1990s onwards, researches in developing, evaluating and comparing these tools have resulted in a variety of approaches to deal with assessment requirements and in fact there is a growing awareness about the inadequacies of these tools in fostering environmentally sensitive building design. These tools have evolved over the years partly owing to the calls of the researchers. Nevertheless their primary assessment core seems to have not changed and their application in projects is growing in number in many countries, including Turkey. Therefore we need to understand what would be the promise of these tools in steering us towards a new paradigm, possibly through a number of innovations in the socio-technical system of built environment. This is again a hard task for such tool that only assesses buildings against a set of environmental or social criteria. We might not expect this to happen regarding their old-dated mechanistic worldview underlying their approach.

However their growing use in the market and by consequence the dissemination of their understanding of sustainability drives this study to reveal their use that

[28] Raymond J. Cole, "Building Environmental Assessment Methods: Redefining Intentions and Roles," *Building Research and Information* 33, no. 5 (2005), 455-467.

possibly touches upon the “rules of the game” or, in other words what they really do in projects. Without understanding their current role in possibly triggering the socio-technical systems and thus the practices, talking about ways to change the assessment tools would remain insufficient. Especially the growing use of international assessment tools in contexts different than their country of origin is a key topic as these systems are context-bound and their use might not result in expected outcomes.

1.1.2 THE LOCUS OF THE STUDY

Disregarding the diversity in the debates in the field, it may be argued that the researches in the field are divided into two camps. One is concerned with a direct contact with the design field, by introducing new design or evaluation tools, the other is theorizing about our common future, thus delineating ways to shift our worldview towards a sustainable future. We can include researches dealing on environmental assessment tools, energy efficient design tools, and simulation softwares, into the first camp. The second camp strives to redefine how we shall posit new design and construction processes by including all the interested parties in the world, and how we shall define a new paradigm. This study is located in-between, or at the boundary, of these two camps.

1. Paradigm: Regenerative paradigm
2. Building environmental assessment tools

The thesis foresees benefit in making a research that interprets the role of BEATs in reaching the objectives of this new paradigm that put forth groundbreaking suggestions for alleviating the problems stemming from human activities on world. To conduct this analysis the study looks into:

3. Socio-technical systems and architectural design practices

and adopts:

4. Multi-level perspective and social practice theory

This goal calls for a number of heuristic tools that would help the study to frame both the design practices with these tools and the interaction of design practices with interested systems of provision, such as energy, transportation, policy… In this sense, there is another third research strand, which is not fully related with the researches in the field of designing but which is however adapted into this study.

Regarding the motivations for innovation in the built environment, researchers in the field have started recently to discuss the benefits of applying innovation theories mainly developed in “established research traditions on the economics and management of innovation that come into contact with work on innovation from sociological and political perspectives.”[29] The above given objectives lead the study to heuristic frameworks developed in the nascent field of sustainability innovation studies, which study these systemic changes, usually called ‘socio-technical transitions.’ Regarding the multi-dimensionality in the interested parties within the production of built environment, the study foresees benefit in pursuing the middle-range theory called Multi-Level Perspective, mainly developed by Rip

[29] Jennifer Whyte and Martin Sexton, "Motivations for Innovation in the Built Environment: New Directions for Research," *Building Research and Information* 39, no. 5 (2011), 474.

and Kemp,[30] and subsequently applied most prominently by Smith and Geels.[31] This heuristic device enables researches to understand how niche practices, like the practices with LEED or BREEAM interact with overarching regime practices (normal practices), and possibly owing to the innovations brought by the new practices alter the routine, or stabilized ones. The second theory that helps this study to frame the design practices with BEATs is developed in researches on social practice theory (SPT). There is a growing literature that undertakes research on architectural design processes through the use of SPT.[32] Based on this theory the study develops a heuristic tool adjusted for understanding case studies.

1.2 WHY THE PROBLEMS IN TOOLS ARE IMPORTANT

By aligning itself with this theoretical framework, the study now turns into the first camp of researches. Albeit the vast amount of these tools, it is observed that current practice, or market we might say, has turned towards voluntary building environment assessment tools, BEATs.[33] The present study will argue that these tools are developed based on a mechanistic worldview; by consequence do not reflect the ‘reality’ of sustainability in design and therefore in the built environment. If we reflect on the problems stemming from both their structure or content and their applications in design processes, we observe that:

1. BEATs are developed to assess the product, not the process. They only present goals and intents, not a process or a guide to achieve those goals. Regardless of these objectives of these tools, it is seen that in the absence of better alternatives, BEATs have become design guidelines.
2. BEATs are inadequate in reflecting an integrated approach in evaluation schemes, which is argued to be the de facto of designing sustainably. By incorporating a variety of objectives into the system, decision-making process depends on a multi-criteria perspective, rather than on a single dimension.[34] However, BEATs act in a checklist manner to demonstrate whether a building meets certain qualitative and quantitative criteria, and the final performance is the sum of the points gained from the constituent environmental credits. The performance credits are independent so as to avoid double-counting; they are thus isolated from each other.[35] The optimization of only one criterion without

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30 Frank W. Geels, "The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms," *Environmental Innovation and Societal Transitions* 1, no. 1 (2011), 25.
31 Frank W. Geels, "From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory," *Research Policy* 33, no. 6-7 (2004), 897-920.; Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 24-40.; Adrian Smith, "Translating Sustainabilities between Green Niches and Socio-Technical Regimes," *Technology Analysis & Strategic Management* 19, no. 4 (2007), 427-450.
32 Suzanne M. Zukowski, "From Green to Platinum: LEED in Professional Practice" (PhD Dissertation, The University of Wisconsin), . In her thesis, Zukowski carried out a research on architectural projects certified with LEED, and analysis case studies based on Giddens’ social practice theory.
33 The energy-efficiency certifications put into force by local governments are as well assessment tools, however they have become compulsory for many European Countries, including Turkey as of 2011.
34 R. Janikowski, R. Kucharski and A. Sas-Nowosielska, "Multi-Criteria and Multi-Perspective Analysis of Contaminated Land Management Methods," *Environmental Monitoring and Assessment* 60 (2000), 89-102.
35 Raymond J. Cole, "Building Environmental Assessment Methods: A Measure of Success," *The Future of Sustainable Construction*, no. Special issue (2003).

considering its effects on the building is not a solution.[36] Thus, it becomes the practitioners' duty to develop strategies and tactics that make sense in the context of the document.

4. The tools give information about "component" knowledge, but not concept knowledge.[37] While component knowledge refers to analysis on energy, daylighting analysis or water consumptions, concept knowledge entails the ability to foresee the relationship and interaction of the component knowledge. Enhancing concept knowledge is therefore needed to design according to the tools.
5. The application of the assessment is usually carried after the completion of the design process.[38]
6. Despite the lack of a generally accepted approach to the concept of sustainability in architecture, the field is in the search of defining "best practices." Current discussions on environmental assessment tools best illustrate this trend.
7. BEATs are developed based on the specific requirements of a country, then their international application in different contexts becomes problematic. Furthermore, the adaptation of a BEAT into different countries by incorporating the local exigencies into an already existing tool brings about a number of new considerations.
8. These problems are seen to hinder the possibility of selecting an optimum project and the contributions of these methods revealed through the POE evaluations show that they are inadequate to address the environmental sensitiveness of buildings.[39]

1.3 OBJECTIVES

Considering the calls to attain sustainability in architecture and the critiques of on these tools, the thesis aims at exploring the influence of BEATs on projects certified with LEED or BREEAM in Turkey and employs a multi-methodology approach, including both qualitative and quantitative approaches that will be explained below. The main *objective* of the thesis is to unveil how architects make sense of these tools, and how the process is guided by these tools. Especially how the use of a tool developed for another context, such as the use of BREEAM or LEED for a project in Turkey deviates from traditional practices is a central issue. The study reveals the impact of these tools on architectural design practices from the perspective of architects, because regarding the routine practice in Turkey the architects have a significant role on project decisions due to the lack of IDP.

If the future direction and success of sustainable buildings, especially in Turkey, rely on the abilities of these tools, then a scrutiny on the practices with these tools

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[36] Thomas Lützkendorf and David P. Lorenz, "Using an Integrated Performance Approach in Building Assessment Tools," *Building Research and Information* 34, no. 44 (2006), 334-356.
[37] Ann Heylighen and Herman Neuckermans, "Design(Ing) Knowledge in Architecture" (Paris, EAAE/ARCC Conference, 2000).
[38] Appu Haapio and Pertti Viitaniemi, "A Critical Review of Building Environmental Assessment Tools," *Environmental Impact Assessment Review* 28, no. 7 (2008), 469-482.
[39] Benjamin J. Birt and Guy R. Newsham, "Post- Occupancy Evaluation of Energy and Indoor Environment Quality in Green Buildings: A Review" (Delft, 2009).

and how these practices interact with overarching structures, or regimes like energy, transportation, materials, is vital. Therefore, the second major objective of this study is to reveal whether these tools might enable major deep-structural changes in the building sector. The thesis therefore aims at tying the research findings to the necessities of the proposed regenerative paradigm in order to pave the way for improvements in the next generation tools.

In order to fulfill these objectives, the study formulates a number of specific research objectives based on the theoretical framework developed in the study:

1. First objective:
    - Delineating how BEATs get into the scene and rather interact with design practices and how these practices deviate from normal practices. Understanding whether architects have become practitioners or just learnt about this new practice with BEATs.
    - Investigating whether an integrated design process is enabled by BEATs or whether this use has hindered this process due its checklist manner.
    - Investigating how concept knowledge is fostered by possible innovations in the design process, as BEATs diffuse on component knowledge.
    - Revealing whether BEATs lead to a certain type of practice. Revealing whether this practice preclude attaining alternative design solutions, as it might limit the process to predefined technological fixes.
    - Revealing which type of innovation is brought about with the use of BEATs.
2. Second objective:
    - Is it possible to state that practices with BEATs represent a niche activity?
    - How have specific obstacles in gaining credits shifted first the practice and do these then have possible repercussions in the regime level?
    - Is it possible to observe that learning in practices disseminates into regime actors in terms of “social learning” or does it remain only as “actor learning,” that is, only those who take part in the practices learn and restructure themselves?
    - What are the innovations brought by BEATs for users? Buildings do have a life after being finished, they turn into designs-in-practices, and therefore analysis of possible shifts in everyday practices of occupants is important.

1.4 SIGNIFICANCE OF THE STUDY

There is a need to further our understanding on the role of the practitioners in shifting their professional practice relative to these green building initiatives. BEATs lay down the component knowledge in the form of criteria, thus it is up to the practitioners to develop their concept knowledge, and thus their knowledge and actions that enables the interactions of these criteria in designing. Facts and ideas developed over the life cycle of real practices are therefore essential to determine the influence of assessment tools in framing the actions of practitioners.

This study develops two heuristic models to fulfill the objectives. The first model is developed through the adaptation of Shove and Pantzar’s model for studying everyday practices[40] into the architectural practice to examine architectural design practices with BEATs. The second model is developed after a model first suggested by Shove, and further developed Hargraves that combines MLP with SPT. The study adapts this model into the context of socio-technical system of built environment to analyze the interaction of the practices with BEATs with the regimes active on the socio-technical system of built environment. To the best of the knowledge of the author, these theoretical frameworks and the conjunction of these two models have not been applied to study the innovation pathways of LEED or BREEAM.

The multi-methodology approach to data collection undertaken by this study (case studies, survey questionnaire and literature review on certified projects) aims at generating a broad review of the field in Turkey. The study observes how BREEAM or LEED affect the design professionals in terms of their design decision-making practices and routines, along with the problems that pertain to this process in the context of a developing country. By revealing practice-based knowledge, this study will feed current literature that mostly focuses on the deficiencies of the guideline, by providing a holistic approach to the analysis of the built environment.

1.5 LIMITATIONS

This study focuses on the impact of BEATs on architectural design practices from the perspective of architects. It makes certain interpretations about the intersection between these practices with other practices, what will be later called, regimes, such as energy, transportation, science, and policy, but the study does not particularly conduct a research on these intersections. The study makes certain assumptions about the innovation pathway with BEATs. However understanding the full pathway would at least require looking at more than a decade, while BEATs are on the scene less than six years in Turkey. Therefore these interpretations along with the model developed based on MLP and SPT might guide future researchers.

1.6 TERMINOLOGY

Given the vast body of literature on environmental assessment of buildings, there are many terms used in parallel for denoting the same assessment module. These are method, tool, system, or scheme. Tool is seen to be the most frequently used one, thus when the term tool is used, it refers for environmental of sustainable assessments, such as BREEAM, LEED, CASBEE… Malmqvist makes an accurate distinction between the terms tool and method as follows:

> Tools are intrinsically developed for practical use, in contrast to the *research methods* for building assessments used for academic discussions or the

[40] Mika Pantzar and Elizabeth Shove, "Understanding Innovation in Practice: A Discussion of the Production and Re-Production of Nordic Walking," *Technology Analysis & Strategic Management* 22, no. 4 (2010), 447-461.

> *theoretical methods* that may form the basis for a tool. However, such methods are also referred to as tools in much of the literature.[41]

In line with Malmqvist, in order to make this distinction between tool and method, within this thesis the term method is used to denote research and theoretical methods.

There is also a discrepancy between the use of terms rating and assessment. The term assessment is used as a broad term, but rating is only used for referring to tools that aggregate the assessment into a single rating score. BREEAM and LEED in this sense are rating tools. An overview of terms included in the study on BEATs will be detailed in chapter 3.

1.7 RESEARCH METHODOLOGY

Table 1-1 details the research levels pursued in this study in terms of data, output and the analytic methodology followed.

Tab. 1-1: Table explaining in levels the research methodology explanation

	DATA	OUTPUT	METHOD
LEVEL 1: GLOBAL CONTEXT ANALYSIS + THEORETICAL FRAMEWORK	**Existing literature** **1.1** Sustainability in architecture	**1.1** The impact of worldviews on the framing of sustainability problems; Designing in regenerative paradigm; Evolution of the concept of sustainability; Analysis of the current discourse on sustainability	Literature review
	1.2 Previous research on BEATs + BREEAM guideline + LEED Guideline	**1.2** Main problems in BEATs. Based on the first output (1.1), analysis of BEATs from the perspective of ecological worldview.	Literature review Qualitative analysis
	1.3 Innovation theories (MLP and SPT)	**1.3** Based on innovation theories development of 2 heuristic models to analyze case study projects	Literature review Method development

[41] Tove Malmqvist, "Methodological Aspects of Environmental Assessment of Buildings" (PhD Dissertation, KTH Architecture and the Built Environment, Royal Institute of Technology), .

LEVEL 2: CASE STUDIES	A. AN OFFICE BUILDING IN AYDIN (LEED) Semi-structured interviews held by the author, project documents[42] (Drawings, documents from project meetings) B. FRITERM FACTORY (BREEAM) Semi-structured interviews held by the author, project documents[43] (Drawings, documents from project meetings) C. TARSU SHOPPING MALL (BREEAM) Semi-structured interviews held by the author, project documents (Drawings, documents from project meetings) D. AKPLAZA OFFICE BUILDING (BREEAM) Secondary sources (Interviews published in the literature, published material about the project) E. 35. SOKAK HOUSING PROJECT (BREEAM) Secondary sources (Project presentation by the architect, published material about the project) F. TMB BUILDING (LEED) Secondary sources (Interviews published in the literature, published material about the project)	1. Case study analysis Based on the first heuristic model for each project: * Problems stemming from the process. * Based on qualitative analysis, determination of the influence of BEATs on the elements of the practice: Knowledge, meaning, and materials. Based on the second heuristic model: * Framing the interaction between the regimes and these practices 2. Cross-case analysis Analysis of the similar patterns stemming from the design processes; determination of similarities in regime-niche interactions 3. Preparation of questions for survey questionnaire	1. Case study analysis 2. Cross-case analysis For both levels: The data are examined based on qualitative analysis for determination of major patterns in the practices. The coding cycles of project data is detailed in chapter 6.
LEVEL 3: LOCAL CONTEXT ANALYSIS	3.1 Routine practice in architectural design processes: Literature on the Turkish context and the author's own experience	3.1 Analysis of the routine practices in design phases.	3.1 Literature review, qualitative analysis
	3.2 Understanding regimes in the context Legal documents (Policies) Numerical data on projects (LEED and BREEAM)	3.2 Structuring effects of the regime on practices	3.2 Literature review

[42] The project drawings are shared but the name of the owner and the name of the architects working in this project are omitted (a requirement of the designer).
[43] Full consent approved for sharing data and analysis.

	3.3 Survey questionnaire (The question are in the Appendix 1)	3.3.1 Analysis of survey 3.3.2 Qualitative analysis of current understanding of sustainable building.	3.3.1 Quantitative analysis 3.3.2 Qualitative analysis
LEVEL 4: EVALUATION	**OUTPUTS FROM THE PRECEDING LEVELS** **(LEVEL 1)** **(LEVEL 2)** **(LEVEL 3)**	Analysis of all of the output materials, or findings from the preceding levels. * Determination the shifts in design practices. * Determination of the barriers to the process * Determination of the contribution of BEATs to other regimes * Assumptions about the possible transition pathway *Explanations for future studies	INTERPRETATION BASED ON THE MODEL DEVELOPED IN LEVEL 1 2 heuristic models developed to analyze case study projects will be used in this section.

This study benefits from multi-level data collection and multi-level analysis. The use of the case study approach is considered as an effective strategy to gain holistic and meaningful characteristics of real-life, owing to its potential to see the process.[44] Indeed, the design processes are complex due their knowledge-rich nature. In order to capture the influence of the evaluation tools on such a setting requires an in-depth investigation. The case study approach is also fruitful strategy as it enables using various analysis and data collection tactics.

The study deals with data containing a high degree of complexity; thus it requires interpretative methods, which are also suitable for socially constructed phenomenon. To this end, qualitative analysis is chosen in regard to its “fruitful way of exploring a substantive area about which little is known, or about which much is known but to gain novel understanding.”[45] This strategy enables us to obtain intricate details about the process, compared to other conventional research methods.[46] This methodology is used twice in the study: The analysis of case study data and the analysis of the open-ended question in the survey questionnaire.

Despite its data overload and complex procedures, the methodology briefly described above has been considered useful for this research, since it aims at depicting the people’s experience with the assessment tools in as detailed a manner as possible. This is in line with the intention of this research to delineate

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[44] Robert K. Yin, *Case Study Research: Design and Methods*, 3rd ed. (California: Sage Publications, 2003).
[45] Peter Barrett and Monty Sutrisna, "Methodological Strategies to Gain Insights into Informality and Emergence in Construction Project Case Studies," *Construction Management and Economics* 27, no. 10 (2009), 936.
[46] Anselm L. Strauss and Juliet M. Corbin, *Basics of Qualitative Research : Techniques and Procedures for Developing Grounded Theory* (California: Sage Publications, 1998).

how the knowledge given by the tool is interpreted, shared and used within real practice. It would therefore facilitate “the emergence of fresh issues/ themes in the analysis.”[47] Before delving into the data collection concerning the case projects, the researcher conducted a background literature to gain familiarity with the assessment tools, along with different research avenues in the field. Using this methodology requires the researcher to gradually distill the data through theoretical sampling, and this might indicate avenues for further ‘cycle’ of data collection and analysis.

The six case studies enable the study to determine the recurrent categories regarding the assessment process. According to the insights gained from the case studies, a survey questionnaire was prepared and sent to the key personalities working both in the previous projects and professionals working on certification process. This survey was also sent to academics (mostly architects), architects working in the sector, civil engineers, and mechanical engineers. The intention was to understand the appreciation of these tools and acquire knowledge about people’s knowledge in the field.

1.8 SUMMARY

Chapter 2 introduces the main problematic of our era, that is, the crisis of perception triggered by the mechanistic worldview, which has led to the current sustainability problems. With respect to the discussion on the role of worldviews in understanding the world, and thus lifestyles, the chapter indicates the inadequacy of the mechanistic worldview in representing an accurate picture of reality. By contending that a new sustainability paradigm framed by whole/living systems worldview is a prerequisite for an ecologically adapted way of designing, the chapter first explains the repercussions of the mechanistic worldview in the field of architecture, along with the evolution of the concept of sustainability from 1960s onwards, and second, it discusses what might be the implications of the new paradigm in the field of architecture.

Since the 1990s significant developments that have occurred in building environmental assessment tools have brought forth new approaches to assessment in terms of indicators, assessment categories and criteria. Despite their dissemination around the world and their attraction in marketing the projects, there are many critiques on their basic assessment methods. However, especially in Turkey, they are seen to be one of the main drivers of the concept of sustainability in the building industry. **Chapter 3** introduces the case study tools, that is, BREEAM and LEED, and conducts a review on the state-of-the-art on the critiques of these tools, based on the ecological worldview. Then it correlates the implications of these tools on architectural design processes.

[47] Barrett and Sutrisna, *Methodological Strategies to Gain Insights into Informality and Emergence in Construction Project Case Studies*, 936.

This study intends to investigate the possible role of BEATs in fostering innovations not only at the level of practices of design professionals, along with occupants or users, but also in socio-technical system of built environment to attain sustainability. In this sense, by conceiving buildings as socio-technical artifacts, **Chapter 4** aims at delineating the theoretical framework based on which the case study projects will be analyzed. In regard to the co-evolution of design and the other practices effective on the socio-technical system, the objectives of the study require a two-level approach. While the first level, as practice level, will be delineated through social practice theory (SPT), the second level will be examined through to Multi-Level Perspective (MLP). This chapter introduces and furthers these two theories for the current study.

Innovations are explained to lie in shifting the worldview. However in regard to the socio-technical system of building industry, it does not seem to be an easy task to change people's lenses, and probably only through the use of these tools. To understand the role of BREEAM and LEED in practices, **Chapter 5** lays down the current 'co-evolving' socio-technical system in Turkey. This overview, besides enabling the comparison of new or emergent practices with BREEAM or LEED to the old one, brings forth what might be the major barriers that the new practices will encounter. Following this review, in order to discuss the appreciation of these tools by design, construction, and academic professionals, the study shares the results of the survey questionnaire. To reveal the impact of these tools on the discourse of sustainable buildings, this chapter analyzes the definition of sustainable buildings given by these professionals.

Until Chapter 6, the study discusses the reasons why current socio-technical systems are inefficient in responding to the challenges imposed by sustainability problems. In line with this discussion, for the field of architecture, the study argues that BEATs might not be able to lead building practices towards sustainability transition due to their espoused worldview upon which their assessment mechanism is built. The study details the possible consequences of the applications of BEATs in projects; however does not specifically focus on the real impact of these tools on design practices and the worldviews of architects. Chapter 4 discusses the characteristics of niche innovations, along with their role in changing the overall regime. The study assumes that practices with BEATs are currently niche practices in Turkey. Therefore **Chapter 6** evaluates six case study projects from Turkey which are certified or are in the assessment process with BREEAM or LEED. The analysis is performed based on the models developed in Chapter 4 to reveal, first, the differences of practices with BEATs from practices-as-entities, that is, the regime practices. Second, the analysis indicates possible niche-regime interactions owing to BEATs. Third, with respect to the three dimensions of sustainability (scale, time, and criteria) discussed in Chapter 3, the analysis examines the emergent practice, that is, the practice with BEATs in terms of its premises for the regenerative paradigm. To this end, the main objectives of Chapter 6 can be summarized as follows: How do BEATs interact with the routine practices of architects? How much do these practices deviate from the routine practice of the architect? How do these practices touch the regimes in socio-technical system of built environment?

Chapter 6 discusses in detail the implications of the knowledge, meanings, materials and images carried by BEATs on the design practices of architects. Furthermore it underscores the interactions of these emergent practices with the socio-technical regimes active on the formation of built environment in Turkey. **Chapter 7** makes a synthesis of these emergent practices based on their similarities in the application to BEATs. In innovation studies radical niche activities are considered as the key for sustainability transition. To this end this synthesis enables the study to discuss the deviances of the cognitive, regulative, and normative rules followed by these practices from those established in current regimes. By the same token, the study extends the discussion to reveal the level of innovations of these practices with respect to their alignment with the key prospects of the regenerative paradigm framed by the ecological worldview. The analysis yields that a number of practices do not fall within this new paradigm. The chapter first discusses the reasons of this problem and second suggests ways to raise awareness in designing in line with this paradigm. With respect to the importance of these niche activities in challenging the regimes active on the formation of the socio-technical system of built environment in Turkey, the chapter discusses the pros and cons of the application of these tools and the market transformation through the model developed based on MLP and SPT.

Chapter 8, as the conclusion chapter, summarizes the findings of the thesis and suggests further research avenues in the field.

CHAPTER 2

WORLDVIEWS AND SUSTAINABILITY IN ARCHITECTURAL DESIGN

This chapter introduces the main problematic of our era, that is, the crisis of perception triggered by the mechanistic worldview, which has led to the current sustainability problems. With respect to the discussion on the role of worldviews in understanding the world, and thus lifestyles, the chapter indicates the inadequacy of the mechanistic worldview in representing an accurate picture of reality. By contending that a new sustainability paradigm framed by whole/living systems worldview is a prerequisite for an ecologically adapted way of designing, the chapter first explains the repercussions of the mechanistic worldview in the field of architecture along with the evolution of the concept of sustainability from 1960s onwards, and second, it discusses what might be the implications of the new paradigm in the field of architecture.

Exploring the implications of building environmental assessment tools (BEATs) on the architectural design processes in attaining sustainable built environments necessitates the study to delve into the roots of the major problem of the new globalized world outlined briefly in the first chapter as the crisis of perception triggered by the mechanistic/modernist worldview. In this sense, this chapter will start with the role of worldviews in shaping our perception of the world and trace the repercussions of the mechanistic/modernist worldview on the built environment with reference to the evolution of the concept of sustainability dating back to 40 years ago. In the context of this study, mapping the past developments, "previous contexts, goals, processes and lessons"[1] is crucial not only to understand the main logic effective on the preparation of BEATs, but also "to enquire about the conditions leading to outcomes, what has remained elusive and what, if any, lessons were learned that can be applied to the present and the future."[2]

Instead of remaining a review of past developments, by following the footsteps of the quest for sustainability in the built environment developed over the years, this

[1] Richard Lorch, "The Relevance of Time" (Helsinki, World Sustainable Building Conference, October, 18-21, 2011).
[2] Ibid.

chapter will overlay the contested nature of sustainability and reveal "some sort of stable knowledge base upon which to act."[3] Afterwards, to position the future prospects of sustainability within the architectural realm, the study will introduce the current researches that call for changing the paradigm based on ecological or whole/living systems worldview. This call will be then related to the necessity of making innovations not only in design processes or products, but also in the overall socio-technical system of built environment. To this end, the chapter will discuss the premises of the new paradigm, along with suggestions on ways of attaining sustainability in the architectural design processes.

2.1 WORLDVIEW/EPISTEMOLOGY/ONTOLOGY/METHODOLOGY/ PARADIGM

A worldview, an overall perspective shaped by a collection of concepts, theorems and assumptions (that are not necessarily accurate), is known to have a deep impact on not only how we look at, perceive and think about the world,[4] but also how we carry on our lives on this world. Worldview, compared to mental lenses, is described by Milbrath as "epistemological structures for interpreting reality that ground their picture of 'reality' in their own construction."[5] So there is a close relationship between a worldview held, or our perception of reality, and our epistemology.

Sterling underlines "a close association between epistemology and perception – between how we know and how we see" and describes epistemology as "the operative way of knowing that frames perception of and interaction with the world."

Sterling underlines "a close association between epistemology and perception – between how we know and how we see"[6] and describes epistemology as "the operative way of knowing that frames perception of and interaction with the world."[7] This approach diverges from the conventional philosophical sense of epistemology, –the study of the nature of knowledge, its origins, structure and validity, and is derived from Gregory Bateson's interpretation of the term. Harries-Jones, a scholar of Bateson, states that by epistemology Bateson means "the examination of knowledge in an operational sense: the 'how' of knowing and deciding."[8] In fact, Keeney assumes that epistemology deals with "how people … know things and how they think they know things; how people come to construct and maintain their habits of cognition."[9] Regarding the influence of perception on our epistemologies, Sterling argues that there is another key factor to be considered:

> [o]ur perception is not 'neutral' but coloured by our spiritual grounding and awareness, our belief systems, our creative imagination, and our experiential histories. Thus perception is informed by the *inspirational*, the *affective*, the *imaginal*, and the *experiential* domains. I argue that purpose is associated with or informed by epistemology because, if we take a view of perception that

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[3] Guy, *Pragmatic Ecologies: Situating Sustainable Building*, 22.
[4] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 437.
[5] Lester W. Milbrath, "Stumbling Blocks to a Sustainable Society: Incoherences in Key Premises about the Way the World Works," *Futures* 26, no. 2 (1994), 117.
[6] Stephen Sterling, "Whole System Thinking as a Basis for Paradigm Change in Education: Explorations in the Context of Sustainability" (PhD, University of Bath), 85.
[7] Ibid.85
[8] Peter Harries-Jones, *A Recursive Vision: Ecological Understanding and Gregory Bateson* (Toronto: University of Toronto Press, 1995), 8.
[9] Keeney cited in Sterling, *Whole System Thinking as a Basis for Paradigm Change in Education: Explorations in the Context of Sustainability*, 85. I owe this interpretation to Sterling.

> includes *a priori* knowing… then it is hard to divorce this from values and beliefs.[10]

In a similar vein, ontology and epistemology cannot be separated from each other either. On this interdependence Bateson maintains that:

> In the natural history of the living human being, ontology and epistemology cannot be separated. His (commonly unconscious) beliefs about what sort of world it is will determine how he sees it and acts within it, and his ways of perceiving and acting will determine his beliefs about its nature. The living man is thus bound within a net of epistemological and ontological premises which—regardless of ultimate truth or falsity—become partially self-validating for him.[11]

To this end, following Bateson[12] and Sterling, the study assumes that how we know things (epistemology), descriptions of the structure, function and nature of the things (worldview), what things are (ontology), and therefore how we act within this world (methodology) have a deep relationship among each other and are operationally associated. Therefore a change in epistemology leads to an alteration in worldview.

The study refers to two very literal examples to better illustrate the interdependence between how we see the world and how we perform actions. Edgar Degas (1834-1917) is known to have a progressive retinal disease that caused central (macular) damage. It is maintained that probably in the mid 1880s his visual acuity has started to decline. Changes in his style are observed to correlate with this progressive loss of vision, as he doesn't account in his correspondence that he was intentionally trying to be more expressionist or abstract.[13]

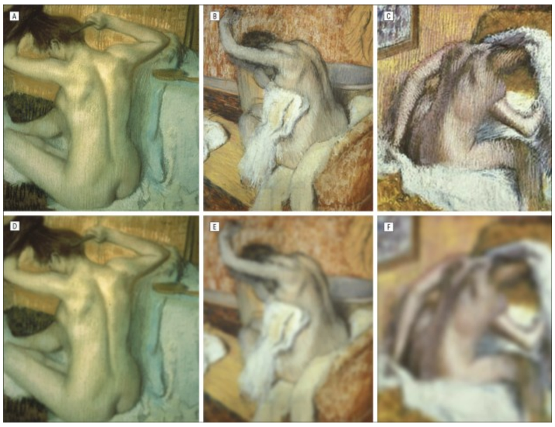

Fig. 2-1: In his article, Marmor gives these images to explain the degradation of Degas's paintings. A,B,C are the real paintings and D,E,F are the images of Degas' vision of his paintings. These images are taken from Marmor's article.[14]

[10] Ibid.,85.
[11] Gregory Bateson, *Steps to an Ecology of Mind* (New Jersey: Jason Aronson Inc., 1972), 228.
[12] Ibid., 228
[13] Michael F. Marmor, "Ophthalmology and Art: Simulation of Monet's Cataracts and Degas' Retinal Disease," *Arch Ophthalmol.* 124, no. 12 (2006), 1764-1769.
[14] Ibid., 1765 "Degas' paintings of nude bathers, showing the change in style (less refinement) over the years from approximately 1885 to 1910. A, Woman Combing Her Hair (1886; pastel, 55 × 52 cm); Hermitage Museum, St Petersburg, Russia/Bridgeman Art Library. B, After the Bath, Woman Drying Herself (1889-1900; pastel, 68 × 59 cm); Samuel Courtauld Trust, Courtauld Institute of Art Gallery, London, England/Bridgeman Art Library. C, Woman Drying Her Hair (1905; pastel on paper, 71.4 × 62.9

While in his earlier works, the objects were drawn quite precisely with details and careful shadowing, in his works pertaining to years 1880s and 1890s, the same subjects were drawn "with shading lines and details of the face, hair, and clothing became progressively less refined" (Fig. 2-1).[15] Surprisingly he was not aware of this problem. An experience carried on paintings with the same level of distortion caused by Degas' disease reveals that "Degas' blurred vision smoothed out much of the graphic coarseness of his shading and outlines. One might even say that the works appear "better" through his abnormal vision than through our normal vision."[16] What he saw was his reality, and his epistemology that mapped that reality was not concurrent with what he intended to do.

The second example is drawn from a woodcut by Albrecht Dürer (1471-1528). In this woodcut (Fig. 2-2), the artist does not only contemplate on the object but he also draws it according to a prescribed method. He views the object through a grid, which acts as a measurement element. The artist trusts the data gained from the grid. Groat and Wang states that

> [i]t is that he accepts certain presuppositions about the empirical universe, to wit, that the objects that make it up can be understood by certain geometric relationships that hold constant. What he assumes is theoretical. What he does based upon those assumptions is methodological.[17]

The worldview of the artist in the woodcut underpins as well his theoretical assumptions, and therefore, his epistemology.

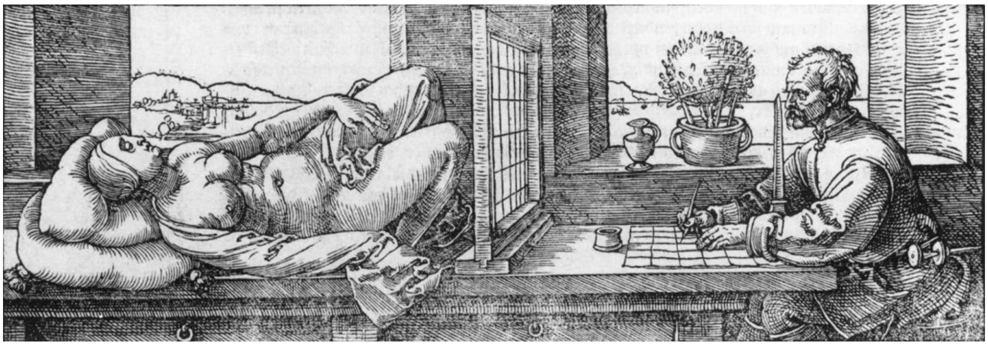

Fig. 2-2: A woodcut by Albrecht Dürer (1471-1528).

Conceiving such a relationship between the aspects of knowing (epistemology, ontology, and methodology) is actually in line with the ecological worldview which will be introduced later in this chapter. This holistic lens enables the study to transcend the fragmentary form of thought characterizing the prevailing reductionist epistemology, that is, the modernist worldview. Thereby we might consider the interdependence among the following questions stemming from these aspects of knowing:

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cm); Norton Simon Art Foundation, Pasadena. The same paintings were then blurred to the level of Degas' eyesight at the time of the painting. D, Woman Combing Her Hair blurred to a visual acuity of 20/50. E, After the Bath, Woman Drying Herself blurred to a visual acuity of 20/100. F, Woman Drying Her Hair blurred to a visual acuity of 20/300. Note that the shading appears more graded and natural in the blurred images than in the original works."

[15] Ibid., 1764

[16] Ibid., 1766

[17] This illustration is used to explain the relationship between theory and method in Linda Groat and David Wang, *Architectural Research Methods* (New York: John Wiley & Sons, 2002), 73-74.

> Ontological question: What is the form of the perceived world?
> Epistemological question: How do we perceive the world, and what are the best ways to understand the world?
> Methodological question: What methods are used to obtain knowledge? What are the methods aligned with the pursued epistemology?
> Teleological question (We might state as well the purpose): What is the intention of the researcher or the designer?

Without separating ontology from epistemology, and therefore the worldview that includes “general theories of value, knowledge and action which form the basis for the scientific and social paradigms congruent with that particular worldview,”[18] the study refers to a model developed by Sterling called ‘whole systems triadic model.’ The model simplifies and clarifies important relationships, pattern and influence of the three interrelated domains of human experience (Seeing, Knowing and Doing). (Fig. 2-3).

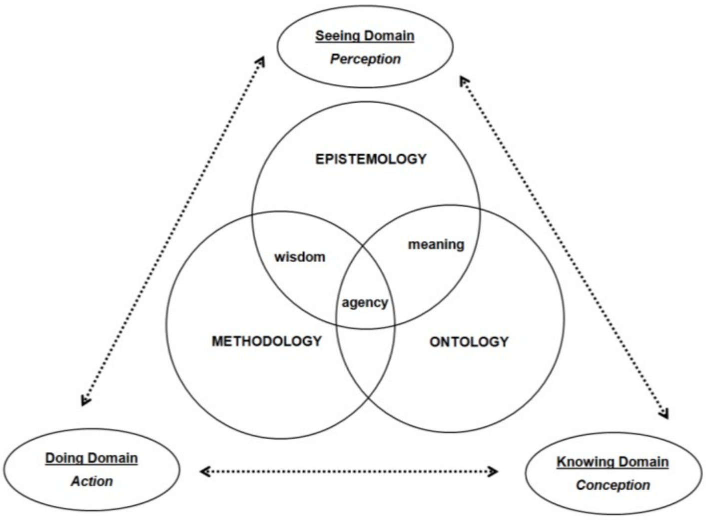

Fig. 2-3: Sterling’s triad model[19]

The interdependence between human experiences, the way human gains knowledge and acts is neatly defined by this model and is concurrent with the worldview that has actually prepared this thesis. Included in the *seeing/perceptual* domain are “how we see the world, make sense of it, and how our filters affect this experience.”[20] The *knowing* domain refers to our ontological view of reality, therefore how we interpret the world, ascribe meanings to things, phenomena, and “express through our constructs, theories, heuristics and concepts.”[21] Sterling states that the *conceptual/knowing* domain does not refer only to our conception of the world, but it also contains how we represent this conception to others.[22] The doing domain, as the *practical* domain deciphers “how we act on and in the world, and with others.”[23]

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[18] Chrisna du Plessis & Raymond J. Cole (2011): Motivating change: shifting the paradigm, Building Research & Information, 39:5, 437
[19] Sterling, *Whole System Thinking as a Basis for Paradigm Change in Education: Explorations in the Context of Sustainability*, 96.
[20] Ibid.,425
[21] Ibid.,425
[22] Ibid.,425
[23] Ibid.,425

Based on this model, in Degas' paintings, what he saw with his eyes, what he knew about the reality, and what he did was aligned to his reality. In contrast, someone with a proper lens or worldview sees another reality out there. This thesis assumes that one concept is missing in this model, that is, teleological beliefs. Actually Sterling states that teleological or purposive acts are categorized under the knowing domain and is influenced by the epistemology held; however the *teleological beliefs or intentions* might remain unchanged even if people share diverse worldviews or epistemologies. This is actually the case for researches or designs seeking for a sustainable world, because the main purpose does not change from one another.

With respect to the necessity in understanding the role of BEATs in framing design considerations or solutions and the correlation of this model to social practice theory (SPT), which accounts for the structures influencing the reproduction of practices for which the way we experience reality has crucial implications, this model will be used several times for analysis later in this study. Furthermore, the thesis will refer again to the role of epistemology in interpreting the reality, because the formation of a worldview, as mentioned above, is highly dependent on the experiences that one has over one's lifetime. And most of these experiences, the thesis assumes, are shaped by cultural influences. From a social practice theory perspective, (Chapter 4), the designers' decisions are structured by local and also global contexts and the meaning given to certain design decisions are highly influenced by how the designers conceive the local or global context.

Now the study turns to the relationship of these knowing domains through the perspective of paradigm. Even though the notions worldview and paradigm are frequently used interchangeably, there are particular differences among each other.[24] Paradigm refers to a set of practices that define a scientific discipline at a particular time and provides models and solutions to researchers based on a particular worldview. What distinguishes paradigm from worldview is that a paradigm must be shared by a group of people, while worldview can be held only by one person.[25] The word paradigm comes from Greek 'paradeigma,' which means "pattern, example, sample" and from the verb 'paradeiknumi.' The prefix 'para-' means 'alongside' and 'deiknumi' means 'to show, to point out.'[26] What 'paradigm' shows alongside is central to this study.

In his book *The Structure of Scientific Revolutions*, Thomas Kuhn (1922-1996) states that an accepted paradigm, which has its own defined rules, can influence the way –in his case, the scientific area– we perceive the world, thus might impose a way of thinking. Even though the rules of a paradigm are not accepted by the whole scientific world, the perspective of a paradigm influences traditions and practices.[27] Even further, paradigm equips people with available tools, thus

[24] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 438.
[25] Sterling, *Whole System Thinking as a Basis for Paradigm Change in Education: Explorations in the Context of Sustainability*, 120.
[26] Walter W. Skeat, *A Concise Etymological Dictionary of the English Language* (New York: Cosimo, 2005).
[27] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 3rd ed. (Chicago: The University of Chicago Press, 1996).

methods. It has a deep impact on defining what sort of questions are supposed to be asked, how those questions are to be structured, thus the epistemology of the researcher, and how the results or the answers to those questions might be interpreted. So a paradigm defines a specific way of viewing reality. Kuhn compares the paradigm to a vehicle for a scientific theory, since it puts forth invaluable information about how – in his case natural sciences – nature behaves and what it does and does not contain.[28] These explanations, acting as a map, enable the researchers to delve into more complex details. He states that

> since nature is too complex and varied to be explored at random, that map is as essential as observation and experiment to science's continuing development… paradigms provide […] also with some of the directions essential for map-making. In learning a paradigm the scientist acquires theory, methods, and standards together… Therefore, when paradigms change, there are usually significant shifts in the criteria determining the legitimacy both of problems and of proposed solutions.[29]

Paradigms are not only beliefs about what the world is, they also serve the purpose of legitimization. They constrain courses of actions. This echoes the normative aspect of paradigms. A paradigm offers a set of preconceptions inherited from the past that is brought forth into each new situation. It acts as lenses of a worldview through which a particular reality is perceived. So it would be true to state that paradigms show a particular way of interpretation and investigation along a worldview.

Another key term that the study will refer to is 'paradigm shift.' According to Kuhn paradigm shift is a change in the basic assumptions of the ruling theory of science. Kuhn states that these shifts occur when researchers encounter anomalies, which cannot be explained by the tools provided by the accepted paradigm and which throw the scientific discipline into a state of crisis. The formation of a paradigm is a process accompanied with effective events, ideas, and traditions.[30] New ideas are tried during this period and eventually a new paradigm is formed. The ground breaking shift is actually the shift in worldviews, thus in the way we, for example, perceive the natural phenomena. Thus a change in worldview is a prerequisite for a paradigm shift.[31] Such a shift impacts all aspects of knowing from ontology, to epistemology, and thereby, methodology.[32]

Paradigm shifts occur when researchers encounter anomalies, which cannot be explained by the tools provided by the accepted paradigm and which throw the scientific discipline into a state of crisis.

The present study underlines that our knowledge about the reality of nature lies at the core of the discourses on ways to attain sustainability. As a consequence, the nature of nature or its ontology is highly relevant for the consecutive parts of the thesis. Historically, it has taken centuries to see the influences of the worldviews on human endeavors, social practices and ultimately on built environments.[33] Therefore before proceeding to the discussion on sustainability, we shall first

[28] Ibid., 109.
[29] Ibid., 109.
[30] Ibid., 53-56.
[31] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 437.
[32] For example the acceptance of the theory of *biogenesis* as opposed to *spontaneous generation* dating back to period of Aristotle has totally altered how natural phenomena are investigated.
[33] Raymond J. Cole, "Regenerative Design and Development: Current Theory and Practice," *Building Research & Information* 40, no. 1 (2012), 2.

examine the mechanistic worldview that has drifted us away from "ecologically adapted form of life."[34]

2.1.1 MECHANISTIC/MODERNIST WORLDVIEW

The synchronization problem that underlies the unsustainable "modern" society is explained to have its roots in the Cartesian–Newtonian mechanistic worldview of the mid-17th century that can be traced back to the work of Francis Bacon (1561-1626). The study first accounts briefly the inadequacies of this worldview in understanding world phenomena based on three facts: (1) Humans' approach towards Nature; (2) The scientific approach to the object studies; (3) The nature of nature. Then it continues by accounting the consequences of these facts on Earth.

2.1.1.1 ANTHROPOCENTRIC WORLDVIEW

The mechanistic worldview depends on anthropocentric or human-centric worldview that "implicitly places human enterprise dominant over and essentially independent of nature" and that "ascribes only instrumental or 'use' value to nature."

First of all, the mechanistic worldview depends on the so-called **anthropocentric or human-centric worldview** that "implicitly places human enterprise dominant over and essentially independent of nature"[35] and that "ascribes only instrumental or 'use' value to nature,"[36] while conceiving humans as the source of all values.[37]

2.1.1.2 THE OBJECTIVE STUDY OF NATURE AND THE CLASSIFICATORY LOGIC

The second fact is related with a critical epistemological turn occurred in this period: '**The objective study of nature**.' According to this view, to fully understand an idea or a thing (the thing or "other"), one must separate him or herself from the study (the scientist or "self") and should not feel a sense of relation to it, in other words, a feeling of empathy.[38] This represented a quest for objectivity released from a relativistic approach. Tanzer and Longoria argues that "[o]ver centuries, the perceived scientific necessity to separate self from other, subject from object, has been generalized to a societal disconnect severing the individual from a larger network of relations."[39]

Another scientific research track that elicits the above mentioned disconnection in networks is explained to result from **the classificatory logic** of this period. This logic was first prefigured by the work of Raymond Lull and other proto-scientists of the early Renaissance, who "laid out a tiered, prioritized model of the world's knowledge in the form of "memory theaters."[40] It is maintained that "[t]his logic has allowed us to understand a specific idea or thing as a piece of a larger whole, and it has allowed scientists to pursue a rigorous and exhaustive mapping of all the world's knowledge."[41] Following the configuration of the system by the great scientists of the 17th century, new knowledge could therefore be put within existing

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[34] Juhani Pallasmaa, "From Metaphorical to Ecological Functionalism," *Architectural Review* 6 (1993), 74-79.
[35] Cole, *Regenerative Design and Development: Current Theory and Practice*, 2.. William E. Rees, "Achieving Sustainability: Reform Or Transformation?" in *The Earthscan Reader in Sustainable Cities*, ed. David Satterthwaite (London: Earthscan, 1999), 24.
[36] Capra, *Deep Ecology: A New Paradigm*, 19-25.
[37] Ibid., 7.
[38] Tanzer and Longoria, *Introduction: Networked Ways of Knowing*, 4-5.
[39] Ibid., 4.
[40] Ibid., 4.
[41] Ibid., 4.

categories. Over the course of the 18th and 19th centuries, through the development of progressively more specific disciplines, scientists worked on these categories, which have however remained fixed. It is maintained that:

> an important component of the memory theater was lost in the process, and with it the ability for knowledge to relate across categories. Memory theaters were originally imagined as combinatory systems, allowing new relations to be considered through the fresh juxtapositions of ideas or things.[42]

A parallel to this classificatory knowledge is also found in the work of Carolus Linnaeus in Sweden and Georges Buffon in France,[43] who gave a more systematic form to nature by preparing the taxonomy of natural beings, through a tree-like, classificatory diagram based on the formal properties of organic beings. They were then able to turn "the Baconian vision into a full-fledged classificatory mode of sciencing, an *episteme*."[44] Classification, observation, naming and categorization is explained to be central to the science of the classical age, which is motivated by this utilitarian view of nature, anthropocentrism, "that fit well with the more general project of industrialization."[45] In this sense, Foucault, skeptical about the natural history in the classical age, states that "[this] history covers a series of complex operations that introduce the possibility of a constant order into a totality of representations."[46] This logic of classification and the quest of objectivity unfortunately resulted in a world seen through a tree of relations, which precludes understanding the interdependence between diverse branches of the phenomena.

This logic of classification and the quest of objectivity unfortunately resulted in a world seen through a tree of relations, which precludes understanding the interdependence between diverse branches of the phenomena.

2.1.1.3 THE NATURE OF NATURE

The third fact is related with the reality of world, or in other words the nature of nature, as understood based on this worldview. The medieval worldview, which was based on the Aristotelian philosophy and Christian theology, changed in the 16th and the 17th centuries due to "the radical change that were brought by the new discoveries in physics, astronomy, and mathematics known as the Scientific revolution and associated with the names of Copernicus, Galileo, Descartes, Bacon, and Newton."[47]

The method of **analytical thinking**, developed by René Descartes based on "his view of nature on the fundamental division between two independent and separate realms-that of mind and that of matter,"[48] has become an influential method in this period. For Descartes, "the material universe, including living organisms, was a machine […] which could in principle be understood completely by analyzing it in terms of its smallest parts."[49] This metaphor impels humans to conceive not only nature, but also systems or buildings, as machines, that is, complicated systems, which can be reducible to their parts. The properties of the whole can be deduced from the sum of the properties of the parts. Consequences of removing a part can

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[42] Ibid., 4.
[43] For a detailed discussion on the influence of biological developments on the formation of an organic paradigm in architecture see Işıl Ruhi, "A Survey of Form Creation Processes within the Evolution of the Organic Tradition in Architecture" (M.Arch., Middle East Technical University), .
[44] Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*, 75.
[45] Ibid., 76.
[46] Foucault cited in Ibid., 75.
[47] Capra, *Deep Ecology: A New Paradigm*, 19.
[48] Ibid., 19.
[49] Ibid., 20.

be predictable, as systems and parts have fixed functions. Both nature and human nature are assumed to have measurable, predictable, controllable and replicable factors.[50] These systems aim for balance or homeostatis, thus an equilibrium. This conceptual framework "the world as a perfect machine governed by exact mathematical law"[51] is actually the one on which the whole Newtonian mechanics is based.[52] As a result, "[t]he notion of an organic, living, and spiritual universe was replaced by that of the world as a machine, and the world machine became the dominant metaphor of the modern era."[53] The scientist was able to study the phenomena, which were measurable and quantifiable. While becoming a successful strategy throughout modern science, such an obsession with quantification and measurement has deemed irrelevant the data obtained through the other experiences, such as aesthetic and ethical sensibility, values, quality, soul, consciousness, spirit.[54]

2.1.1.4 THE IMPLICATIONS OF MISREPRESENTATION

"The dominant western worldview is that it no longer constitutes an adequate model of reality –particularly ecological reality" (Sterling cited in Sterling, 119).

Developments in sciences, by contending that "the observer is inextricably linked with the phenomenon observed,"[55] have challenged the separateness of the observer from natural phenomena. However, while separating human subjects from its natural setting, the mechanistic model of reality broke the essential dependence of humans on nature. Researchers have revealed the limitations put by the tree of knowledge, along with the reductionist approach to the world phenomena that eludes networked knowing. It is now maintained that "the dominant western worldview […] no longer constitutes an adequate model of reality –particularly ecological reality. The map is wrong, and moreover, we commonly confuse the map (worldview) for the territory (reality)."[56]

From another perspective, Gregory Bateson argues that the ecological crisis has its roots in, what he termed, an 'epistemological error,' which refers to the Cartesian division between body and mind. Fritjof Capra[57] states that Gregory Bateson's revolutionary work, which applied systems thinking to explain the nature of mind, became the first successful attempt to overcome this division.[58] This epistemological error denotes a perception or belief that separates the notion of mind from the natural world, without seeing how they operate interdependently. Thus Bateson states that:

> [W]hen you separate mind from the structure in which it is immanent, such as human relationship, the human society, or the ecosystem, you thereby embark, I believe, on fundamental error, which in the end will surely hurt you.[59]

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[50] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 445.
[51] Capra, *Deep Ecology: A New Paradigm*, 20.
[52] Ibid., 19.
[53] Ibid., 19.
[54] Ibid., 19.
[55] Tanzer and Longoria, *Introduction: Networked Ways of Knowing*, 5.
[56] Sterling cited in Sterling, *Whole System Thinking as a Basis for Paradigm Change in Education: Explorations in the Context of Sustainability*, 119.
[57] Capra, known for his researches on systems theory that has deeply influenced researchers in the field of ecological design, considers Gregory Bateson as one of most the influential thinkers of our time.
[58] Capra, *Deep Ecology: A New Paradigm*, 55.
[59] Bateson, *Steps to an Ecology of Mind*, 341.

This separation or duality in seeing the world reflects in many different areas: Culture vs. nature, civilization vs. wilderness, and city vs. country. This worldview is counterproductive and lies at the core of the current crisis. Bateson explains the main fallacy of this understanding, which has privileged the rights and the well-being of one species above those of all others,[60] as follows:

> When you narrow down your epistemology and act on the premise "What interests me is me, or my organization, or my species," you chop off consideration of other loops of the loop structure.[61]

Therefore, nature is out of the loop, it is not considered as a partner, but rather something to be dominated. Coupled with technological innovations, which empower humans against nature, this so-called anthropocentric worldview has also paved the way to address problems caused by the "external limits" of nature, such as disease, weather, and famine.[62] New technologies, besides extending human capacities in controlling nature, have also enabled to produce extensive food and built environment. This has actually given the allusion of nature to be inexhaustibly big and powerful; therefore nature's capacities were not taken into account, while polluting or even destroying it.[63] Our will of controlling nature through technology has given shape to a lethal problem[64] for our era, which is explained by Bateson as follows:

> When you have an effective enough technology so that you can really act upon your epistemological errors and can create havoc in the world in which you live, then the error is lethal. Epistemological error is all right, it's fine, up to the point at which you create around yourself a universe in which that error becomes immanent in monstrous changes of the universe that you have created and now try to live in.[65]

In accord with the capitalist perspective that supports the dominant form of consumerist corporate capitalism spread by globalization, seeing Nature not as a living system, but only as a service provider for the benefits of humans has reflected actually on the 'doing' realm as underlined by Jamison:

> Science came to be oriented toward the needs of the emerging industrial culture […] Science became a profession, an integral part of industrial society and, within the sciences, more dynamic, exploitative approaches to nature became the dominant "paradigms" or metaphorical thought-figures. In many respects, the linking of science with industrial technology was perhaps the most fundamental process of the nineteenth century; it made possible both the consolidation and expansion of a new economic system, as well as the creation of a range of new forms of cultural expression and social interaction.[66]

Buchanan informs us about the consequences of this 'seeing' of nature as follows:

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[60] Peter Buchanan, "Invitation to the Dance: Sustainability and the Expanded Realm of Design," in *Nature, Landscape, and Building for Sustainability*, ed. William S. Saunders (Minneapolis: University of Minnesota Press, 2008), 114-132.
[61] Bateson, *Steps to an Ecology of Mind*, 340.
[62] Du Plessis, *Towards a Regenerative Paradigm for the Built Environment*, 8.
[63] Alfonso Montuori, "Beyond Postnormal Times: The Future of Creativity and the Creativity of the Future," *Futures* 43, no. 2 (2011), 222-223.
[64] In this study, I intentionally recede from discussing the aftereffects of technology that causes an alienation of humans from the experience of the reality, in terms of doing things. For a critique of this problem, please see Peter McCleary, "Some Characteristics of a New Concept of Technology " in *Rethinking Technology: A Reader in Architectural Theory*, eds. William W. Braham and Jonathan A. Hale (New York: Routledge, 2007), 325-336.
[65] Bateson, *Steps to an Ecology of Mind*, 341.
[66] Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*, 76.

> […] this dominant culture is unsustainable […] [i]ts rapacious appetite for biologically generated resources and prodigiously wasteful production and distribution processes extracts these resources quicker than the earth can replenish them and dumps toxic wastes faster than they can be neutralized and absorbed.[67]

Buchanan also warns us that the future population would probably aspire for such profligate lifestyles of the developed world and therefore in the near future these problems would get ever worse. Such a human-nature split has also undermined the possibility of attaining "the well-being of the two intertwined life-systems –that of humans and the planet."[68] Another important result of this split reflects as the denatured character of humans, which renders the economy as a more tangible aspect, rather than the ecosphere.[69] Sustainable development has started to be understood as economical development.[70] Along with a capitalist perspective, one pole of the tripolar conceptualization of sustainability, which will be explained later in this chapter, has gained significance over the years, that is, the economic pole.

"[T]here appears to be a fundamental mismatch between the deeply systemic world we inhabit (and in part have created) and the fragmented way we predominantly perceive and think" (Sterling 2003, p.99)

Newtonian concepts of objectivity and Cartesian spatial logics are seen to prevail within the discipline of architecture. Researchers underline that most of the currently used methods deemed to lead to a sustainable design are envisioned following the footsteps of this modernist thinking, which have rendered human minds "unable to comprehend, let alone begin to address, the challenge of sustainability." While favoring notions such as simplicity, certainty and immediacy, this worldview has "serve[d] to impede adaptive learning deemed essential for sustainability."[71]

Nevertheless Sterling argues that it is not possible conceive the mind that configured this worldview as completely wrong; therefore he suggests integrating partial truths from the past developments as well. In this sense, he maintains that the map used to see the world can be conceived "right" as far as it works, but its inadequacy in explaining phenomena makes it "wrong or dysfunctional."[72] From this point of view, it might be true to state that initiatives concerning the improvement of the built environment, through, for example, building environmental assessment tools, which are criticized for following a mechanistic worldview, are not completely wrong guides. Thus studies on these tools may integrate their positive accomplishments into new tools. As will be analyzed in the following sections, the repercussions of this worldview on current and future initiatives for a sustainable built environment have to be understood for advancements in our field.

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[67] Buchanan, *Invitation to the Dance: Sustainability and the Expanded Realm of Design*, 115.
[68] Katzschner, *Sustainable Architecture, Planning and Culture - Beyond the Mechanical and Unambiguous*, 122.
[69] Bill Mc Kibben cited in Ibid., 122.
[70] Ibid.
[71] Gladwin, Newburry and Reiskin, *Why is the Northern Elite Mind Biased Against Community, the Environment, and a Sustainable Future?*, 243.
[72] Sterling, *Whole System Thinking as a Basis for Paradigm Change in Education: Explorations in the Context of Sustainability*, 119.

2.1.2 WHOLE/LIVING SYSTEMS – ECOLOGICAL WORLDVIEW

Over the past few years, - a broad range of researchers, despite using diverse terminologies and starting points, converge on the need to change the modernist worldview that has shaped "human intentions and that larger political, economic, and institutional structure that permitted ecological degradation"[73] and that has thereby increasingly drifted us away from a holistic approach to world phenomena. So researchers call for a shift in paradigm from "the current one framed by a mechanistic worldview to one informed by a whole/living systems,"[74] thus an ecological worldview. In this sense, before revealing the repercussions of the outdated paradigm on the built environment, still remaining in the seeing and knowing domain, the study needs to frame the challenges brought by the scientific developments of the past century, along with critical theories. These developments have brought a new way of perceiving the world, in other words, whole/living systems or ecological worldview, which is believed to represent an adequate picture of the reality.

Researchers call for a shift in paradigm from "the current one framed by a mechanistic worldview to one informed by a whole/living systems," thus an ecological worldview.

2.1.2.1 FROM THE PARTS TO THE WHOLE

This section will briefly explain the main characteristics of the ecological worldview developed in several disciplines during the first half of the century and upon which systems thinking is built. While the roots of this worldview have been first elaborated by biologists, who were puzzled with the inadequacy of mechanistic sciences in explaining the metabolism of living organisms, this approach to nature has been further developed by researches in Gestalt psychology, the new science 'ecology,' and quantum physics, along with the writings of the founders of the Romantic Movement.[75] By the introduction of the mathematics of complexity that have enabled the modeling of living organisms,[76] the living organisms have started to be conceived as self-producing and self-organizing wholes. This conception has paved the way to realize that, not only living nature phenomena, but also all systems are integrated wholes.

A concise explanation, given by Capra, on the recurring tension between the ecological and the once dominant Cartesian Mechanistic metaphor reveals the main shift in viewing the world:

> The basic tension is one between the parts and the whole. The emphasis on the parts has been called mechanistic, reductionist, or atomistic; the emphasis on the whole holistic, organismic, or ecological. In twentieth-century science the holistic perspective has become known as "systemic" and the way of thinking it implies as "systems thinking."[77]

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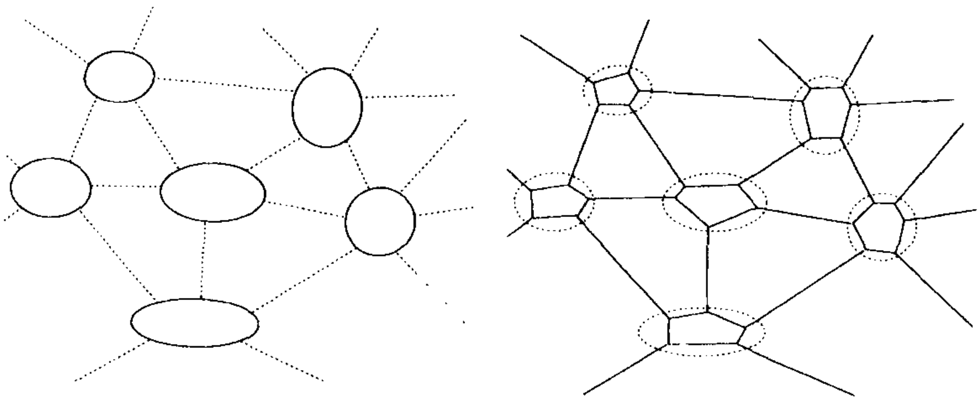
[73] Orr, *Architecture, Ecological Design, and Human Ecology*, 23.
[74] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 437.
[75] Especially writers and scientists considered as the founders or the Romantic Movement have been highly influential on the architects of the early 20th century. For details please see Ruhi, *A Survey of Form Creation Processes within the Evolution of the Organic Tradition in Architecture*.
[76] For an historical account on the development of this worldview please see Capra, *Deep Ecology: A New Paradigm*, 19-25.; Ruhi, *A Survey of Form Creation Processes within the Evolution of the Organic Tradition in Architecture*. Ruhi in her thesis relates the implications of the developments in biology on the design process of architectural design processes in the early 20th and 21st centuries.
[77] Capra, *Deep Ecology: A New Paradigm*, 17.

This change in worldview alters our epistemological approach to the world and thereby its reality. In an ecological worldview, "nature is seen as an interconnected web of relationships, in which the identification of specific patterns as "objects" depends on the human observer and the process of knowing."[78] A part is seen to be defined as merely an inseparable element of the web of relationships. Therefore the focus shifts from parts to whole and by consequence from objects to relationships. While the mechanistic worldview conceives a collection of objects, in which the relationships among objects are secondary, in systems view it is maintained that "the objects are networks of relationships, embedded in larger networks."[79] Capra compares this shift to a figure/ground shift and illustrates it on the following figure (Fig. 2-4). In accord with this part-whole relationship, the elements of the system are interdependent and the whole is more than the sum of the parts.



A B

Fig. 2-4: Figure/ground shift from objects to relationships.[80] While A represent the mechanistic view, B stands for the ecological or systems view.

For a person holding ecological worldview, therefore, relationships become primary. This 'networked thinking' has not only influenced the way we understand nature, but also the metaphor of knowledge, explained above with reference to classificatory logic, which is replaced by that of the network. Capra maintains that:

> For thousands of years Western scientists and philosophers have used the metaphor of knowledge as a building, together with many other architectural metaphors derived from it. We speak of *fundamental* laws, *fundamental* principles, *basic building blocks*, and the like, and we assert that the edifice of science must be built on firm *foundations*.[81]

As the reality based on an ecological worldview, or epistemology, is the result of a network of relationships, then Capra states that "our descriptions, too, form an interconnected network of concepts and models in which there are no foundations."[82] This new approach has revealed another fallacy of the Cartesian belief, that is, the certainty of scientific knowledge. As natural phenomena are relentlessly interconnected, understanding one fact is dependent on understanding all the others. This approach to science propounds that all scientific concept and

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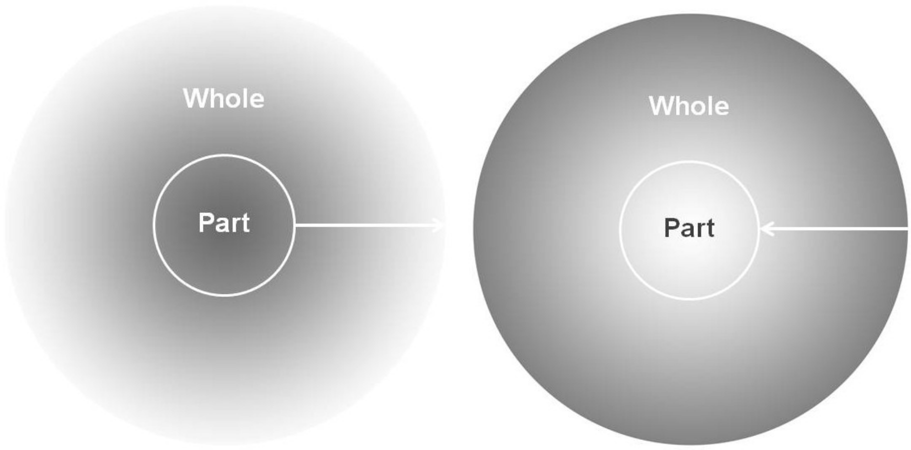
[78] Ibid., 40.
[79] Ibid., 37.
[80] Ibid., 38.
[81] Ibid., 38.
[82] Ibid., 39.

theories can generate only an approximate knowledge, without being able to provide “any complete and definitive understanding.”[83]

To better depict the implications of this shift, Cole, during his speech in SB11 in Helsinki shared the following figures (Fig. 2-5) based on a comparative analysis:



A: Reductive Thinking B: Systems Thinking

Fig. 2-5: Figures representing the relationship between parts and whole in these two views.

While reductive thinking (A) presumes that “the behavior of whole can be analyzed in terms of properties of its parts,”[84] systems thinking (B) accepts that “properties can only be understood within context of larger whole.”[85] This shift replaces therefore the machine metaphor with that of a network metaphor, which “seeks to understand the world, without overly simplifying it.”[86] Especially to loosen systems of classification and hierarchy that entrapped the Western logic, in critical theory, “scholars who employ methods to critique, deconstruct or […] challenge existing intellectual hierarchies often argue that knowledge cannot be fixed in perpetual relations of power and prestige.”[87] They argue that knowledge is constructed over multiple channels of communication within and between texts. So people are born into an already established system of knowledge. They find their way for integration. Such thinking is therefore contextual and depends on the observer. The importance of context in understanding phenomenon, and the part-whole relationship is explained again by Cole with reference to the following example of the bicycle:

While reductive thinking (A) presumes that “the behavior of whole can be analyzed in terms of properties of its parts,” systems thinking (B) accepts that “properties can only be understood within context of larger whole.”

[83] Ibid., 41.
[84] Cole, *Environmental Issues Past, Present and Future: Changing Priorities and Responsibilities for Building Design*, 6-9.
[85] Ibid.
[86] Tanzer and Longoria, *Introduction: Networked Ways of Knowing*, 6.
[87] Ibid., 6.

A: Components B: Context

Fig. 2-6: Figures of bicycle (A)[88] and (B)[89]

These developments urge us to conceive nature and humans as one and only, composed of interconnected and interdependent phenomena. In this way, this new approach alters the relationship of humans to nature as well, because it triggers the whole question of values. In this sense, as will be maintained later, those following whole/living systems or ecological worldview call for gaining eco-centric values, which regards humans as part and partner of nature, instead of an anthropocentric approach.[90]

2.1.2.2 KEY CRITERIA OF LIVING SYSTEMS AND THE PROCESS THINKING

The study turns to the key characteristic of a living network to detail how we have started the world anew. Capra argues that the key comprehensive theory of living system is based on the synthesis of two approaches: The study of pattern (or form, quality, order) and the study of structure (or substance, matter, quantity).[91] He adds another factor, the process of life, which brings about the ultimate realization of natural phenomenon. He briefly defines these three criteria in his book *The Web of Life* (Tab. 2-1).

Tab. 2-1: Capra's description of the key criteria of living systems[92]

Key Criteria of Living Systems
1. *Pattern of organization*: The configuration of relationships that determines the system's essential characteristics
2. *Structure*: The physical embodiment of the system's pattern of organization.
3. *Life Process*: The activity involved in the continual embodiment of the system's pattern of organization.

The pattern of organization of any system is defined as "the configuration of relationships among the system's components that determines the system's essential characteristics."[93] The *structure* of a system refers to the physical embodiment of the pattern of organization of the system. The relationship between these two criteria is explained as follows:

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[88] A: Jim Langley, *What's what on a Bicycle*. http://www.jimlangley.net/wrench/bicycleparts.html.
[89] *Interview with Jeffrey Knowles, Pennsylvania Environmental Council*, 2011). http://hiddencityphila.org/2011/09/activate/.
[90] Capra, *Deep Ecology: A New Paradigm*, 11.; Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 439.
[91] Capra, *Deep Ecology: A New Paradigm*, 158.
[92] Ibid., 161.
[93] Ibid., 158.

> Whereas the description of the pattern of organization involves an abstract mapping of relationships, the description of the structure involves describing the system's actual physical components –their shapes, chemical compositions, and so forth.[94]

The following example delineates the link between the pattern and the structure for a non-living system, a bicycle.[95] Bicycles have a certain kind of pattern of organization, which is configured based on a number of functional relationships among components. Parts or components of a bicycle are designed, produced and unified according to this pattern. The same pattern 'bicycle' might reveal thousands of different structures, such as city bike, mountain bike, or touring bike. The difference between a non-living and a living system actually lies in the third criterion. In a living system, by contrast, the components change continuously, as there is growth, development, evolution and, as will be explained later, adaptation.

The second important strand of systems thinking is process thinking. In contrast to the mechanistic Cartesian science, which conceives of structures as the outcome of a process in which the forces and mechanism interact, in system science "every structure is seen as the manifestation of underlying processes."[96] In the case of the bicycle, the pattern of organization is detailed through the design sketches by the designers. In living systems instead, "pattern of organization is always embodied in the organism's structure, and the link between pattern and structure lies in the process of continual embodiment."[97] This continual embodiment is defined as the autopoiesis, "the pattern of life, as a set of relationships among processes of production,"[98] that gives objects their life.

> Autopoiesis, or "self-making," is a network pattern in which the function of each component is to participate in the production or transformation of other components in the network. In this way the network continually makes itself. It is produced by its components and in turn produces those components.[99]

With respect to the networks or relationships among the parts of the system, the whole system actually co-evolves, including not only the living organism, but also non-living systems, therefore the context, climate, and Earth.[100] This characteristic represents the cyclical nature of ecological processes. As referred to in different occasions in this study, the synchronization problem stems from our linear industrial system that does not have any relevance to this cyclical character. The key to solve this problem is maintained to lie in understanding this notion of **co-evolution**.

This model of self-organization has three characteristics: (1) Process; (2) Open systems operating far from equilibrium; (3) Nonlinearity. The study detailed above the importance of process in the continual embodiment and the co-evolution of the system. Secondly, living systems are seen to be "continually maintain[ing]

[94] Ibid., 158-159.
[95] This example is given by Capra to better illustrate the difference in the pattern of organization and the structure. He then refers to the same example to differentiate between living and non-living systems. Ibid., 159-160.
[96] Ibid., 42.
[97] Ibid., 160.
[98] Ibid., 172.
[99] Ibid., 162.
[100] Ibid., 23.

themselves in a state *far from equilibrium*, which is the state of life."[101] The **non-equilibrium** model "sees ecosystems as open, dynamic and highly unpredictable, process-driven and often regulated by external forces, not necessarily internal mechanisms."[102] The unpredictability of natural phenomena, which leads as well to the above mentioned impossibility in accuracy in scientific experiments, is explained to be the result of the **nonlinear** interconnectedness of the system components.[103] In such systems predicting the results of an input, even through simple deterministic equations, is impossible, as non-linearity produce unsuspected richness and variety of behavior.[104] Removal of one element might change drastically the performance of the system. Besides being an aspect of the network patterns of living systems, non-linearity also dominates much of the inanimate world. Environmental influences might trigger fluctuations according to which new structures of higher order and complexity may emerge, and by exhibiting flexible functions living systems are contextually bounded and adaptive. Another key aspect of ecosystems is **diversity,** which results from the system's network structure. This aspect fosters the ability of ecosystems to be resilient, as "[a diverse ecosystem] contains many species with overlapping ecological functions that can partially replace one another."[105]

Shifting from the conception of nature as a machine, which is a static system composed of static components, and closed to outside influences, "to an open system in which material continually enters from, and leaves into, the outside environment"[106] has also radically changed many fundamental ideas associated with the understanding of nature:

> [A] shift of perception from stability to instability, from order to disorder, from equilibrium to nonequilibrium, from being to becoming.[107]

Capra states that "self-organization, the spontaneous emergence of order, results from the combined effects of nonequilibrium, irreversibility, feedback loops, and instability."[108] Therefore the conception of nature and world phenomena has shifted from **complicated systems to complex adaptive** systems. As a matter of fact, we cannot consider 'the planet as a deterministic clockwork system' anymore.

2.1.2.3 THE CHALLENGE OF A NEW WORLDVIEW FOR SUSTAINABILITY PROBLEMS

This change in worldview, thus perception, has three implications for the conception of solutions to the environmental crisis. First, nature represents a very precise sustainable environment. Therefore to cope with sustainability problems humans might learn from Nature, how it works, evolves, and maintains its well-beings. In line with this approach, Capra suggests that "[s]ustainable patterns of production and consumption need to be cyclical, imitating the cyclical processes in

[101] Ibid., 181.
[102] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 439.
[103] Capra, *Deep Ecology: A New Paradigm*, 85.
[104] Ibid., 122-123.
[105] Ibid., 303.
[106] Ludwig von Bertalanffy cited in Ibid., 48
[107] Ibid., 180.
[108] Ibid., 192.

nature. To achieve such cyclical patterns we need to fundamentally redesign our businesses and our economy."[109]

Second, the present study argues that what we see, what we know, and what we do are totally interdependent. What we see and thereby know is altered with this ecological worldview: "Instead of being a machine, nature at large turns out to be more like human nature –unpredictable, sensitive to the surrounding world, influenced by small fluctuations."[110] Hence the change in seeing both nature, and the sustainability problems might alter how we make decisions, in other words how we act on this world, by taking into account the principle of interdependent and intricate network of relations, what Capra calls, the web of life. Third, an organic approach to sustainability would be the imitation of the 'thinking' system of nature, based on a holistic and ecological approach.

Herein the study outlines the main differences among the ontological, epistemological, and methodological approaches of these two worldviews. Table 2-2 actually combines the two traditions in the history, preservation and human ecology, introduced by Andrew Jamison,[111] as the whole/living sustainability paradigm framed by the ecological worldview, which will be introduced below, stands at the intersection of these traditions.

Tab. 2-2: Comparison of mechanistic and whole/living systems worldviews

	Mechanistic	*Whole/living systems*
Ontological	Anthropocentric/modernism	Eco-centric/pragmatic
Conception of nature	Ecosystem Resource base	Community, locality Region, landscape
Epistemological		
Thinking[112]	Rational Analysis Reductionist Linear	Intuitive Synthesis Holistic Nonlinear
Values	Expansion Competition Quantity Domination	Conservation + regeneration Cooperation Quality Partnership
Relation to nature	Management Exploitation	Harmony, participation, Regenerative
Methodological		
Type of sciencing	Experimentation / modeling	Planning / co-construction

[109] Ibid., 299.
[110] Ibid., 193.
[111] Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*, 80.
[112] Capra, *Deep Ecology: A New Paradigm*, 98.

2.2 THE REPERCUSSIONS OF THE MECHANISTIC WORLDVIEW ON THE CONCEPTION OF SUSTAINABILITY IN ARCHITECTURE

"... modern Western industrial societies remain entrapped in a dominant Cartesian-Newtonian mechanistic worldview" (Gladwin, Newburry, Reiskin 1998, p. 243)

The preceding sections revealed the impact of worldviews on the seeing and knowing domains. Here, the study reconciles the implications of the mechanistic worldview on the doing domain and maps past developments that have also triggered the formation of BEATs.

2.2.1 THE EVOLUTION OF THE CONCEPT OF SUSTAINABILITY

The following overview has aims to reveal the multiple responses generated in the field of built environment in the pursuit of sustainability, with reference to the social construction of the concept of sustainability. By revealing the impact of the mechanistic worldview on the pursuit, this section also indicates how the ecological worldview has been part of discourse, even if with a low impact.

2.2.1.1 PHASES OF ENVIRONMENTALISM

Acknowledging in brief the evolution of environmental agenda from 1960s to the present is essential to ground the current status of sustainability in the field of built environment, as it has had a key role in the formation and then in the evolution of the multiple opinions and perspectives on sustainability in architecture, or in other words, the contested nature of the concept of sustainability. This agenda has also evolved in line with the new worldview and has been shaped mainly by public pressure that has by consequence influenced governmental and political initiatives.[113] A review of the field reveals the phases of environmentalism as illustrated in Table 2-3. Beyond the evolution process, the table pinpoints the key events catalyzing awareness on environmental issues, the key concepts that address the sustainability problems in the field, and the essential methods developed based on these architectural concepts.

There appears to be diverse but concurrent categorizations of the phases, and the only difference lies at the level of detail. The first strand of the table (1) refers to the categorization made by Jameson who focuses mainly on the breath of social and political movements that have essentially formed the making of an environmental consciousness. He maintains that even though the time frames might exhibit variances from country to country, the making of an environmental consciousness have undergone six phases. The second strand (2), taken from John Elkington,[114] defines three waves of public pressure on the uptake of environmental issues. The first wave defined as "limits" is parallel to the awakening, age of ecology, politicization, and differentiation periods. The second wave defined as "green" connotes the period of internationalization period. The third wave referred as "global" correlates with the integration period. The third (3) and fourth (4) strands are both suggested by Cole and make a projection of 40 years as well.

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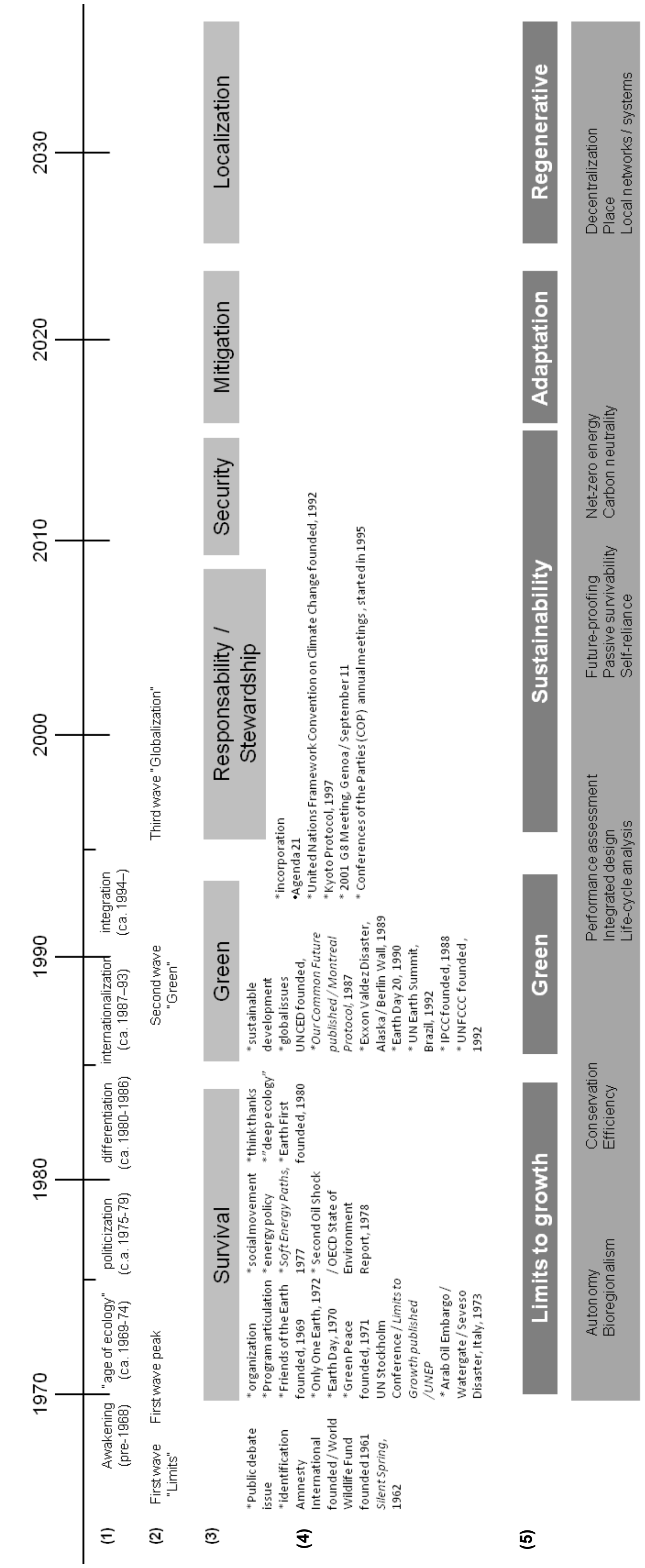
[113] John Elkington, "Enter the Triple Bottom Line," in *The Triple Bottom Line: Does it all Add Up? Assessing the Sustainability of Business and CSR*, eds. Adrian Henriques and Julie Richardson (London: Earthscan, 2004), 7-8.
[114] Ibid.

Tab. 2-3: Table representing the phases of environmentalism



(1) The phases by Jamison
(2) The phases by Elkington
(3) The phases by Cole
(4) Architectural reflection of these concepts as given by Cole

While the third refers to the concepts that emerged in many fields out of these developments, the fourth one stands for the architectural reflection of these concepts and consists of a number of key design considerations given underneath the fourth strand.

The period from the late 1940s till the late 1960s, might be conceived as the period of **awakening**, because "the post-war mode of economic development, with its dependence on science-based innovations and its relatively unproblematic view of science and technology"[115] has started to show its consequences, which gave rise to widespread public debates.

The environmental debate throughout the period, named a**ge of ecology (1969-74)** reveals a broad scope, ranging from resource use, environmental impacts, population growth, food protection, social and community structure.[116] These debates, coupled with scientific researches made it possible to understand that "environmental impacts and natural resource demands have to be limited,"[117] as the planet would not be able to address all these demands. In the field of architecture, we observe that there was interest in projects in alternative or even radical technologies, along with "grassroots activities emphasizing alternative values, lifestyles and technologies."[118]

The first oil crisis, in 1973-74, triggered a major shift in debates and put the energy supply and use at the top over the period called **political challenges (1974-80)**. The major consequence of the energy debates was "a professionalization of environmental concern and an incorporation by the established political structures of what had originally been a somewhat delimited political issue."[119] This has resulted in the development of new institutions of knowledge production and the formation of new kinds of disciplines or sub-disciplines. What is most characteristic of this period was the breadth, the unity and coherence of the environmental movement, which prepared the ground for a very short time "an organized learning experience in which theory and practices were combined in pursuit of a common collective struggle."[120] The struggle was against how we perform actions on this world. The intention, as was the case in the previous period, was to envision alternatives lifestyles.

As of late 1970s, it has not been possible to maintain the unity in struggle anymore, due to broadening and diversification of environmental problems, along with the neo-liberal political shift that characterizes this period of **patterns of differentiation (1980-86)**. Neo-liberalism changed the course from a social emphasis or policy agenda to a "more explicitly economic and commercial

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[115] Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*, 85.
[116] Cole, *Environmental Issues Past, Present and Future: Changing Priorities and Responsibilities for Building Design*, 6-9.
[117] Elkington, *Enter the Triple Bottom Line*, 1-16.
[118] Cole, *Environmental Issues Past, Present and Future: Changing Priorities and Responsibilities for Building Design*, 6-9.
[119] Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*, 87-88.
[120] Ibid., 89.

orientation"[121] that does not support substantive programs of social movements. New programs, developed based on industry-university collaborations and academic entrepreneurship, and the development of new niche markets, such as wind and solar energy, and waste recycling, have started to replace and reduce in scope social movements, which produced *alternative approaches* to politics. Due to the specialization process, by the mid-1980s, it is maintained that environmental movement has lost its coherent unity, thus has lost its ambition to critique the lifestyle that has actually caused the environmental degradation.

Jamison conceives the developments in the first half of 1980s as part of an agenda that has withdrawn the issue from the public stage, with the intention of establishing new institutions.[122] During this period of **internationalization (1987-1993)**, due to deregulation and weakening of state controls over economic development, it is maintained the 1980s saw a new type of capitalist expansion. Technological innovations especially in telecommunications and information-processing paved the way for conducting business and financial operations across national boundaries. Based on a new "ideology, or value-system, that tends to glorify individual risk-taking and entrepreneurship,"[123] the so-called globalization has started to influence "environmental politics by shifting responsibility over decision-making directly into the hands of the corporations."[124]

Awareness raised on new environmental problems –climate change, ozone depletion, loss of biodiversity– has changed the scale of emphasis to a global scale, while actually leaving aside the local problems. The solutions to these 'global' problems have started to step into scene with the catchword of our era, sustainable or sustainability, which was first coined in the report of the World Commission of Environment and Development (1987), or with its well known name 'The Brundtland Report,' which demarcates a turning point for environmental agenda. In cooperation with new actors and political constituencies, The Brundtland Report was written by a committee composed of scientists, government officials, representatives of non-governmental organizations, and business firms. The ecological problematic reframed by the commission challenged the sectorial "autonomy" by calling "for the integration of economics and ecology and for the linking of environmental problems to other issues of income and resource distribution, poverty alleviation, armed conflict, and gender equality."[125] Therefore the report has extended the problem in scope, by incorporating previously detached fields, economics and social and introduced the well-known definition of the term 'sustainable development,' as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." Another often quoted definition of sustainability, which appeared in 1991 in IUCN publication *Caring for the Earth*, has also put forth the same approach: "to improve the quality of life while living within the carrying capacity of living ecosystems." John Urry and Phil Macnaghten state that:

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[121] Ibid., 91.
[122] Ibid., 93.
[123] Ibid., 93.
[124] Ibid., 93.
[125] Ibid., 94.

> Both definitions share the underlying belief that economic and social change is only sustainable and thereby beneficial in the long term when it safeguards the natural resources upon which all development depends.[126]

This approach to anthropocentric practices put forth that "sustainable development at any scale can only be achieved through the balancing of the three" poles,[127] that is, Environment, Society, Economics. By implementing the roots of the tripolar model –known also as three Es, three Ps, or triple bottom line– these definitions have become one of the main guides of the field that aims at alleviating sustainability problems. This model was further concretized at the Rio Conference (1992), which set down an action plan for sustainable development through Agenda 21.[128] However the well-known triangular model, which conceives sustainability as a triangle of competing interests, was first modeled by the International Council for Local Environmental Initiatives (I.C.L.E.I.) commissioned by UN to implement Agenda 21. While picturing the "sustainable development as a "three legged stool," these authors "suggested that sustainability initiatives could not stand as a whole without equal support from the three constituent social networks that represent the interests of ecology, economy and equity."[129] Attaining an optimum relationship among these poles is based on a reform-oriented *inclusionary* discourse. In contrast to the previous environmental debates, this understanding sought to facilitate a non-adversarial approach to environmental politics. However Hajer and Fischer state that "[s]ince there is now a general consensus around sustainable development—so this argument goes—there is no longer need for conflict, only for collaboration."[130] This model has also become one of the main drivers of formulations of sustainable design practices in the building sector that will be discussed later in this chapter.

This study maintains that the major problems that we face today result from our modern techno-industrial arrangements and our perception of nature that are based upon the essential features of capitalism. Continuous reliance on economic growth that creates ever more new markets characterizes the basic understanding of capitalism, which also uses this growth to gain power to create space for political interventions. In fact, it is maintained that all these facts are

> various key practices of modernity working to further this political–economic dynamic: the dominance of scientific rationality and expert knowledge, the strong reliance on –and belief in– technological innovation as the agent of progress, the implicit legitimization of the use of violence, and the central tendency to see nature as an exploitable resource or as an externality.[131]

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[126] Phil Macnaghten and John Urry, *Contested Natures Theory, Culture and Society* (London: Sage Publications, 1998), 213.
[127] Steven A. Moore, "Models, Lists, and the Evolution of Sustainable Architecture " in *The Green Braid: Towards an Architecture of Ecology, Economy, and Equity*, eds. Kim Tanzer and Rafael LongoriaRoutledge, 2007), 61.
[128] Alain Findeli, "Sustainable Design: A Critique of the Current Tripolar Model," *The Design Journal* 11, no. 3 (2008), 301-322. Moore, *Models, Lists, and the Evolution of Sustainable Architecture* , 60-73. Also it is explained to be a social construction.
[129] Ibid., 61.
[130] Frank Fischer and Maarten A. Hajer, eds., *Living with Nature: Environmental Politics as Cultural Discourse* (New York: Oxford University Press, 1999), 4.
[131] Ibid., 5.

However, underneath this framework there lies the idea of an ecological modernization, on which three dominant assumptions are effective.[132] First, this ecological framework, which conceives the economic development and sustainability in one hand, presumes that human knowledge and therefore its scientific capabilities are well sophisticated to identify in advance the limits to nature. Therefore it enables us to "exploit resources safely up to that limit."[133] It is argued that such a conception of nature, in line with mechanistic worldview, subscribes to the doctrine of 'environmental realism.'[134] Environmental problems have started to be treated as global/technical issues, which relies on increasingly sophisticated scientific programs that have the capacity to reveal the impact of "so-called anthropogenic' or human effects on planetary processes."[135]

As suggested by Guy and Farmer, "such 'environmental realism' is founded on the notion that 'rational science can and will provide the understanding of the environment and the assessment of those measures which are necessary to rectify environmental bads.'

Second, "the discourse exposes the assumption of the human as a rational agent."[136] People are conceived as individual agents that act rationally based on the information available to them. Their ignorance about the consequences of their practices on environment is therefore rectified by the provision of information by states and corporation, which is believed to "engender concern; and concern will translate into both personal and political behaviour changes."[137] Third, the discourse assumes that people's actions are line with their knowledge and concern about environmental issues. It follows an "optimistic model of personal agency."[138] Macnaghten and Urry state that:

Humans are considered as rational agents.

> People's relationships to states in whose environmental activities they are asked to participate and the businesses whose 'green' products they are requested to buy are here seen as unproblematic. Individuals act simply as 'responsible' citizens and consumers; the institutional context in which their behaviour occurs is implicitly assumed to be benign or irrelevant. [139]

However these assumptions lead to two problematic issues: First the nature of information and second the belief in people's ability to change their practices. With the support of public policies and global management strategies, people are again functioning in the realm of the mechanistic worldview due to their faith in expert systems, a scientific understanding that "can engage and mobilise the wider public"[140] to reach the ultimate goal of sustainable development. People still believe "in the project of economic development and the idea of progress (albeit within limits)."[141] By consequence, it is argued that "the metaphor of 'sustainable development' in itself […] leads environmental politics astray."[142] This conception is actually accused of perpetuating the existing institutions without reconsidering "the normative and cultural assumptions and premises underlying their operational practices."[143] Instead of fundamental social change in practices, this conception

This conception perpetuates the existing institutions without reconsidering "the normative and cultural assumptions and premises underlying their operational practices."

[132] Macnaghten and Urry, *Contested Natures Theory, Culture and Society*, 217-218.
[133] Fischer and Hajer, *Living with Nature: Environmental Politics as Cultural Discourse*, 5.
[134] Macnaghten and Urry, *Contested Natures Theory, Culture and Society*, 217.
[135] Ibid., 217.
[136] Ibid., 218.
[137] Ibid., 218.
[138] Ibid., 218.
[139] Ibid., 218.
[140] Ibid., 218.
[141] Ibid., 218.
[142] Fischer and Hajer, *Living with Nature: Environmental Politics as Cultural Discourse*, 4.
[143] Ibid., 4.

has foreseen only adjustments for basic institutional practices.[144] Such an understanding has triggered an incremental approach to the innovations in technologies, including the building technologies as well, without addressing the basic practices that might have caused the problems.

Important messages revealed throughout the preceding years within the environmental discourse that criticized industrial progress – especially its dependence on the viability of endless material growth and consumption – have evaporated over the course of this new era of sustainability. John Berger calls this era "the culture of progress," which has lost "the deeper cultural critique of modern society itself."[145]

To avoid the contingent complexities of sustainability, application of universalized systems of measurement has become a new guide, regardless of cultural diversity.

Further implicit in this modernist discourse is the belief in standardization that would find an all-encompassing solution to environmental problems. Being sustainable is seen to be defined with universal ways. This belief has actually restrained the development of more temporarily and spatially focused attempts, by ignoring 'particular local conditions' and competing 'forms of local knowledge.' Jamison strongly argues that institutional success of particular environmental NGOs could be conceived as a constraining force on local environmental discourses. The study will focus later especially on the standardization process developed as a consequence of the internalization period, because it is this period that has triggered the standardization process for attaining sustainability in the built environment. Actually, it is in this environment that the first seeds of the building environmental assessment tools have been implemented.

By incorporating different kinds of social actors, ranging from politicians, NGOs, economists to designers, the quest for sustainable development led to the diversification of interpretations, thus to different discourses and practices[146] by bringing forth the 'contested nature of sustainability.' As the quest for sustainable development is now getting immersed into specific national political cultures, organizational structures, and institutional contexts, we might expect the emergence of diverse "discourses" and practices in the near future. This diversification of the meaning and therefore the goal of sustainability have also influenced the conceptualizations of sustainability in the building sector. This will be detailed in the following sections.

Over the course of the **integration period** from 1994 onwards, the quest for sustainable development has ultimately spread into the disparate worlds of knowledge-making. Research activities have started to be undertaken in the private sector that has also incorporated entrepreneurship in universities. Emphasis is explained to be given to "the institutionalization and development of environmental management procedures, and so-called cleaner technologies." Thus ecological modernization, in these entrepreneurial processes, with its strong faith in technology, has led to "a new age of green engineering."[147]

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[144] Ibid., 5.
[145] Ibid., 3.
[146] Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*, 94.
[147] Ibid., 96.

2.2.1.2 A COMPARATIVE ANALYSIS OF COGNITIVE REGIMES OF SUSTAINABLE DEVELOPMENT

Hajer underlines that the environmental discourse, if analyzed closely, is fragmented and contradictory, as it is shaped by a collection of claims and concerns stemming from diverse actors and communities.[148] In fact, in contrast to the attempts for standardization of solutions, it is maintained that "[a] fundamental feature of the new environmental politics is that there is no one true, or trusted, form of expertise, no single path to the truth."[149] We observe the emergence of a number of competing academic, or analytical, responses against the environmental degradation. Jamison argues that these responses are equally true, as they are based on different ideals of scientific knowledge as well as 'epistemic criteria.' The work of Bruno Latour, John Hannigan, MacNaghten and Urry, and many other researches argue that categories of nature and naturalness are actually socially constructed. Ingolfür Blühdorn explains the lack of consensus as follows:

> In the discursive realm of ecopolitics, there is no single and objective reality called "nature," but only an unlimited number of competing and ever-changing conceptions of naturalness each of which has its own perspective on what ought to be valued and protected, and what constitutes an environmental problem or concern. Therefore, no reliable ecological imperatives can be read off nature.[150]

This problem leads to "what Aant Elzinga has termed "epistemic drift," a situation in which knowledge production is carried out without any overall accepted framework of validation or shared set of beliefs."[151] Furthermore the priorities of sustainability "have become very politically charged with some economists even urging us to forget climate change as the least of our worries, and to instead focus on AIDS, water and hunger."[152] What remains central to the discourse is that there is no certain agenda that might put forward strategies to engage with sustainability.

The following sections will indicate that the lack of consensus on interpretations of sustainability, which is also problematic in our field as well. However these interpretations might be placed on a continuum between two opposing poles, as argued by Jamison:

> The one pole is optimistic, progressive, and business-oriented, and, in some of its variants, has been characterized as signaling a new stage of modernity. The other is critical, often pessimistic, and tends to put in question the very idea of modernity and the myth of progress that is so central to modernist thinking.[153]

This opposition is triggered by the differences among the cognitive regimes of sustainable development active over the phases of environmentalism. These regimes are divided by Jamison into three: Residual, dominant, emergent.[154] The present study argues that the third one, emerging regime, belongs to the regime

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[148] Maarten A. Hajer, *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process* (Oxford: Oxford University Press, 1995), 1-2.
[149] Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*, 27.
[150] Ingolfur Blühdorn, "The Politics of Unsustainability: COP15, Post-Ecologism, and the Ecological Paradox," *Organization Environment* 24, no. 1 (2011), 38-39.
[151] Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*, 27.
[152] Guy, *Pragmatic Ecologies: Situating Sustainable Building*, 22.
[153] Jamison, *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*, 28.
[154] Ibid., 178-179.

framed by ecological worldview and it will be explained later in this chapter. Each regime is explained to pursue diverse approaches to sustainable development, technological development, and knowledge-making in general. The reason of this diversity is explained as follows:

> These regimes are grounded in different types of human agency, each with its own characteristic form of social action and particular constituencies and actor-networks. In cognitive terms, we may distinguish not only the various kinds of knowledge-production that are favored by each of the regimes but also the different "tacit," or embodied, forms of knowledge that are mobilized.[155]

Table 2-4, prepared by Jamison, details the differences in these regimes.

Tab. 2-4: Cognitive regimes of sustainable development[156]

	Residual	*Dominant*
Type of agency	local/national	transnational
Forms of social action	traditionalist/resistance	commercial/ brokerage
Type of knowledge	factual/lay	scientific/managerial
Tacit forms	place/roots	discipline/skills

2.2.2 SUSTAINABILITY IN ARCHITECTURE

Ever since its introduction into the architectural discourse, conceptualizing sustainability in architecture has gained paramount significance in designing and the term 'sustainable architecture' has acquired various meanings. Here I say meanings, because even though the aim of sustainable architecture remains the same, its definitions change contingent on suggested methods to achieve sustainability. Thus its conceptualization remains entrapped into the worldview that guides the doing part, thus the methodologies. Despite numerous initiatives to explore sustainable design prospects, standards, and practices, there is still no exact way that leads to sustainable cities or buildings. The reason for this lack is explained by Simon Guy as follows:

> Debates about sustainable architecture and cities are shaped by different social interests and diverse agendas, based on different interpretations of the environmental challenge and characterized by different pathways, each pointing towards a range of sustainable futures.[157]

Guy further maintains that "environmental concerns are both time and space specific and are framed by the identification of specific and dynamic models of nature, which delimits the selection of design and development responses."[158] In this sense, debates about sustainable architecture and cities are explained to be parallel with the competing environmental debates explored in the preceding sections. Then the contested nature of sustainability correlates with studies in architecture, as "the multiple ways environmental problems are identified, defined, translated, valued and then embodied in built forms through diverse design and development pathways."[159]

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[155] Ibid., 178.
[156] Ibid., 179.
[157] Guy, *Pragmatic Ecologies: Situating Sustainable Building*, 21.
[158] Ibid., 21.
[159] Ibid., 24.

2.2.2.1 THE TRIPOLAR MODEL

Current methods for sustainable design are seen to have continuously stepped into the architectural scene with different conceptualizations of the tie between the elements of the 'tripolar model:' Society, environment, and economics. As explained above, even though the roots of this model were first delineated in the Brundtland report (1987), and further concretized at the Rio Conference (1992), there is actually no consensus on how to conceptualize its framework.[160] As a three-legged metaphor, this model has become a commonplace in architectural researches through the diagram pictured by the planner Scott Campbell (Fig. 2-7).[161] In Campbell's diagram, "the three corners of an equilateral triangle represent the competing interests of the three Es and the sides represent a set of conflicts that occur naturally in any modern society."[162] He attributes planners and architects in democratic societies the role of stabilizing the conditions of conflict stemming from the poles of the model,[163] therefore based on this approach, the elusive ideal of sustainable development leads one to the center of the diagram."[164]

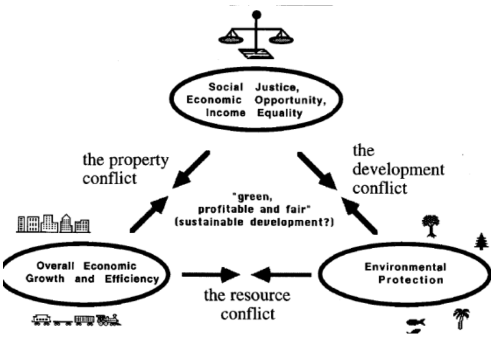

Fig. 2-7: Campbell's diagram: The triangle of conflicting goals for planning, and the three associated conflicts

Regarding the influence of this diagram in shaping architectural discourse, this study refers to Michel Foucault (1926-1984) who defines discourse as the "regularity (an order, correlations, positions and functionings, transformations)" [165] between a numbers of statements, events or objects, appearing in a specific time. This regularity conveys a "*discursive formation*" (italics in original).[166] The rules of the discourse are not only active on the existence of statements or definitions in a field, but also govern their appearances.[167] From this point of view, the tripolar model implicitly merges into the statements. The introduction of this model into the discourse is not a coincidence, as indicated by Foucault, the emergence of

[160] Findeli, *Sustainable Design: A Critique of the Current Tripolar Model*, 301-322. Moore, *Models, Lists, and the Evolution of Sustainable Architecture* , 60-73. Also it is explained to be a social contruction
[161] Ibid., 61.
[162] Ibid., 61.
[163] Scott Campbell, "Green Cities, Growing Cities, just Cities?: Urban Planning and the Contradictions of Sustainable Development," *Journal of the American Planning Association* 62, no. 3 (1996), 296-312.
[164] Ibid., 298.
[165] Michel Foucault, *The Archeology of Knowledge and the Discourse on Language* [L'Archéologie du Savoir], trans. A. M. Sheridan Smith (New York: Pantheon Books, 1972).
[166] Ibid., 38.
[167] Ibid., 30.

discursive rules is not random, but has a specific time and space along with its own social, economic, geographical identities.[168]

Institutions, in our case architectural firms, ecologists, researchers are explained to have an essential role on the formation of a discourse as well as its appropriation with the knowledge and the power they carry.[169] In fact, even though the tripolar model does not lead to a single interpretation of living with nature, it somehow defines a system of rules, and controls the formation of sustainability discourse. The model can be considered as a judge formed of special communities who ensure the rationality of the answers. The significance of such a discourse is that it helps to maintain the focus of designers on specific parameters. It is observed that many institutions have adopted it as the a priori tool, which is used to first conceptualize sustainable development and then measure it.[170]

Most of the definitions of sustainability in architecture converge on defining frameworks that establish the relationship between the three poles, referred also as forces or goals of sustainability: Economics, environment, society. Herein lies two problems. The first stems from the differences in the conception of sustainability by these poles. They belong to different research contexts, and interpret the problems through their proper tactics and strategies that depend on diverse parameters. For example, an economist reflects upon the environmental and social issues depending on his/her "economical theoretical and conceptual framework,"[171] and it goes without saying that the same process of argumentation for sustainability accounts for an environmentalist or a sociologist. Their solutions to be implemented into projects drive from their own point of view and this situation prepares the ground for the second problem, which is bound to the complexity of attaining such a balance between the solutions suggested by these poles. Furthermore, each project is specific to its context that represents specific economic, social and environmental problems. The correlation among these problems is therefore dynamic, which might be handled only through a systemic logic.[172] So far there is no consensus on how to handle this complex relationship. It is observed that each definition of sustainable design in the literature that will detailed later, foresees the problem from different lenses, and thus reframes the solutions from different point of views. In an architectural project, handling the tripolar model, despite its problems, is left to the designer, whose strategies and tactics of analyzing design problems are completely different from those of economists and sociologists.

Another problem stems from the distribution of power among practitioners. Campbell's model represents an idealized model, as "the resolution of conflicting

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168 The conditions preparing the background of this model are actually detailed in the previous section. Ibid., 117.
169 Ibid., 227.
170 Moore, *Models, Lists, and the Evolution of Sustainable Architecture* , 60.
171 Findeli, *Sustainable Design: A Critique of the Current Tripolar Model*, 301-322.
172 Ibid..

social values requires the presence of what Sandra Harding has called a 'valuable stranger.'"[173] On this issue Moore and Engstrom states that:

> Unfortunately, when valuable strangers are in short supply, the resolution of social conflict tends to drift to the corner of the triangle inhabited by the most powerful players. In Weber's terms, then, creative public conflict and alternative technological choices tend to be suppressed by the process of standardization promoted by market forces and the state, which consistently favour the interest of economic development over those of environmental protection or social equity.[174]

Haraway argues that all knowledge claims are 'power moves, not moves toward truth.'[175] Therefore, the powerful player redistributes power relations within the poles of Campbell's triangle and the model, thus the building logic is aligned to the particular conceptualization of the world of the powerful one.[176] Therefore, despite the model's significant role in shaping the architectural discourse, by prioritizing developmental over environmental objectives, it is criticized for perpetuating the mechanistic worldview.[177]

By prioritizing developmental over environmental objectives, the tripolar model perpetuates the mechanistic worldview.

Further criticism is raised on its heuristic methodology, which is shaped after the mechanistic worldview. Ultimately residing in our fragmentary form of thought, the model divides the problems into its parts and looks for devising the whole from the sum of the parts. Moreover the model conceives the world as a static entity, thus it represents sustainability "as a static or balanced condition existing only at the centre of the triangle".[178] However as mentioned above, natural organisms sustain themselves, as they are always in motion, in a state of non-equilibrium. So based on the ecological worldview, this model is outdated. If we compare this model to "the standards and codes that govern technological networks,"[179] in line with Moore and Engstom, the present study argues that they are "temporary agreements about how we will live together, not immutable laws."[180]

The model conceives the world as a static entity, thus it represents sustainability "as a static or balanced condition existing only at the centre of the triangle".

2.2.2.2 DIFFERENT MEANINGS OF SUSTAINABLE ARCHITECTURE

Parallel to the environmental debates, the study indicates how the conception of sustainability in the field of architecture has also evolved over time and has produced 'true' pathways entitled by different namings, as indicated on the timetable (Tab. 2-3). A search into the field brings out the following namings: Green, Eco-Design, Sustainable Design, Ecological Design, Bioclimatic Design… In fact over the years, the term "sustainable" has become an umbrella term to signify actually diverse design concepts. Canizaro and Tanzer, through their analysis of the field, inform us about five competing definitions of sustainable architecture:

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[173] Harding cited in Steven A. Moore and Nathan Engstrom, "The Social Construction of 'green Building' Codes: Competing Models by Industry, Government and NGOs," in , eds. Simon Guy and Steven A. Moore (New York: Spon Press, 2005), 60.
[174] Ibid., 60.
[175] Harraway cited in Ibid., 61.
[176] Ibid., 61.
[177] Ceridwen Owen and Kim Dovey, "Fields of Sustainable Architecture," *The Journal of Architecture* 13, no. 1 (2008), 12.
[178] Moore and Engstrom, *The Social Construction of 'green Building' Codes: Competing Models by Industry, Government and NGOs*, 60.
[179] Ibid., 60.
[180] Ibid., 59.

> 1. Buildings and environments that help to establish an integrated relationship with nature.
> 2. Buildings and environments that preserve and/or improve local ecosystems and which focus on long-term planning and a wider geography.
> 3. Buildings and environments that result from civic action in which environmental quality, understood both physically and socially, is essential.
> 4. Buildings that satisfy a series of benchmarks (i.e., LEED) defined by experts, interested parties, and politicians.
> 5. Buildings and environments that save and/or conserve energy and satisfy our real and perceived needs.[181]

Another research undertaken by Guy and Farmer[182] identifies six alternative logics of ecological design (Tab. 2-5). They underline the relevance of environmental debates on the formation of logics as follows:

> Each of the logics highlight the ways in which the green building debate is framed differently depending upon competing constructions of the environmental problem and alternative concepts of what might constitute a sustainable place. These contrasting environmental discourses "mobilise biases in and out of the environmental debate," thereby shaping the subsequent design strategy.[183]

Tab. 2-5: The six competing logics of sustainable architecture[184]

Logic	**Image of Space**	**Source of knowledge**	**Building Image**	**Technologies**
Eco-technic	global context macrophysical	technorational scientific	commercial modern future oriented	integrated energy efficient high-tech intelligent
Eco-centric	fragile microbiotic	systemic ecology metaphysical holism	polluter parasitic consumer	Autonomous renewable recycled intermediate
Eco-aesthetic	alienating anthropocentric	sensual postmodern science	iconic architectural New Age	pragmatic new nonlinear organic
Eco-cultural	cultural context regional	phenomenology cultural ecology	authentic harmonious typological	local low-tech commonplace vernacular
Eco-medical	polluted hazardous	medical clinical	healthy living caring	passive nontoxic natural tactile
Eco-social	social context hierarchical	sociology social ecology	democratic home individual	Flexible Participatory appropriate locally managed

[181] Vincent Canizaro and Kim Tanzer, "Introduction," *Journal of Architectural Education* 60, no. 4 (2007), 4-14.
[182] Simon Guy and Graham Farmer, "Reinterpreting Sustainable Architecture: The Place of Technology," *Journal of Architectural Education* 54, no. 3 (2001), 140-148.
[183] Ibid., 141.
[184] Ibid., 141.

They explain that each logic lies in the development of diverse approaches to space through which solutions to environmental problems are addressed; diverse interpretations of environmental knowledge as seen and understood from the worldview held are introduced into design, and therefore distinct images of building in relation to the environments of the local context emerges.[185] This classification should not be considered to remain static, therefore logics may be mixed and co-inhabited in different design processes.[186] However the study argues that this table, although referred to by many in the literature, stems from the classificatory logic that neglects some of the relationships among the diverse design considerations. For example, Glenn Murcutt is categorized under eco-cultural logic; however he might also be considered in the eco-centric logic or eco-social. The main premise of this classification is its breadth in accounting how diverse conceptualizations of sustainability in designing have been addressed by architects. All these researches highlight the social production of space, place, and the environment.

The seeing domain created over the internalization period is seen to have been one of the main drivers of the doing domain in architecture, by focusing design professionals on the need of conservation of and efficiency in resources. Along with the belief in the potential of scientific and technological developments in alleviating human impact on earth, the sustainability field in architecture has converged on the necessity to design buildings that conserve the environment by attaining efficiency, thus consuming efficiently. In this sense, regardless of these multiple conceptions, the study observes the eco-technic logic, based on mechanistic worldview, has become the driving logic of the field. It is especially this period that propounded the idea of assessing the impact of buildings through assessment tools.

Buildings conceived “as closed, localized system with circular metabolisms that selfregulate into an equilibrium state,” are designed following the objective of no waste and maximum resource efficiency.

For buildings shaped after mechanistic worldview, the desire is to attain “a steady-state and conservation of status quo.”[187] Buildings conceived “as closed, localized system with circular metabolisms that self-regulate into an equilibrium state,”[188] are designed following the objective of no waste and maximum resource efficiency. This view enhances optimization, balance and efficiency in designing. The anthropocentric worldview and humans’ will to control nature has resulted in perverse consequences: Fragmentation, loosening of the couplings of elements and a focus on parts, without conceiving the whole characterizes a “sustainable” design process that “tend to be exceedingly reductive in problem definition and analysis, as well as in design responses.”[189] If we design a building, as a complicated system, as if solving an optimization problem in the search for the most eco-efficient solution, by focusing on technical innovation, we might lose the chance of conceiving “a complex comprehension and contextualization of the

[185] Ibid., 141.
[186] Ibid., 141.
[187] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 436-449.
[188] Ibid., 439.
[189] Michael U. Hensel, "Sustainability from a Performance-Oriented Architecture Perspective – Alternative Approaches to Questions regarding the Sustainability of the Built Environment," *Sustainable Development* 20, no. 3 (2012), 147.

The design solutions stemming from this approach do not require any particular improvement or change in our practices.

design problem,"[190] and thus impede our design work to be environmentally holistic and anticipatory.

2.2.2.3 CULTURAL APPROACH TO TECHNOLOGY AND SUSTAINABILITY

Liberating ourselves from the environment, along with the regnant faith in sciences and the pervasive optimism about our technological possibilities, has had various implications on researches in built environment and real practice. The pursuit of eco-technic logic has brought forth the use of technology as key for reducing the footprints of buildings, without altering the ever-expanding needs of late-modern societies, such as mobility, flexibility, individuality, technology, energy, and travel. The design solutions stemming from this approach do not require any particular improvement or change in our practices. In fact, the ever-expanding human needs have become non-negotiable and for our field it is the role of designers to develop ways to meet them. This problem stems from the choice of "contemporary individuals who have embraced the principles of consumer capitalism."[191] On this issue Blühdorn argues that

> the fixed and the variable parameter have been interchanged: the emphasis has shifted from *life reform* aiming to bring individual lifestyles and societal practices into line with *categorical*, that is, non-negotiable, ecoimperatives to reformulating these imperatives in line with systemic needs and lifestyle preferences that have themselves acquired the status of non-negotiability.[192]

If we look at the reflection of these non-negotiable demands on design solutions, we might listen to Glenn Murcutt, who succinctly describes this problem as follows:

> There's no reason why we should lose sustainability as a consequence of inventing technology. Sustainability could still be within that but we create for ourselves a problem and that is we want to seal our buildings up. We don't want dust to come in. We want to control the air. Assume that we want to control everything.[193]

A further problem lies in this understanding:

> Now, the technology said what we decided was we want to control the climate to being the same throughout the year, and that is very unhealthy for us because our body needs to have changes.[194]

We might argue that there are also crucial non-negotiable needs considered for the architectural design, such as comfort levels in buildings, public access to buildings, lightening, or the number of elevators. The availability of technologies in the default setting of designing and then their impact on design-decision making process necessitate this study to gain insight from sociologist and theologian Jacques Ellul (1912–1994), who once wrote in a pessimistic manner: "Our machines … have truly replaced us."[195] With reference to Ellul, David Orr argues that we have no philosophy of technology, as if were to be, it would have put limits and definitions and defined areas that technique will not allow."[196] Consequently, the discussions on technology are released from the questions concerning its evolution,

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[190] Guy and Moore, *Sustainable Architecture and the Pluralist Imagination*, 15.
[191] Blühdorn, *The Politics of Unsustainability: COP15, Post-Ecologism, and the Ecological Paradox*, 5.
[192] Ibid., 38.
[193] Glenn Murcutt, Interview, May 22, 2012.
[194] Ibid..
[195] Jacques Ellul cited in Orr, *Architecture, Ecological Design, and Human Ecology*, 20.
[196] Jacques Ellul cited in Ibid., 20

beneficiaries, and the reasons underpinning its advances. Ellul argues that “we are shut up, blocked, and chained by the inevitability of the technical system,”[197] until we face the self-contradictions of the technological developments.

This approach has two implications for our field. First, we are getting more and more embedded into the inevitability of technical system, thus into a dynamic: “Technology begets more technology.”[198] The underlying pattern of Western society is explained to moved from simple tools, to technocracy, and then to “technopoly.” In the first stage, tools were used to solve problems without disrupting the culture in which they are embedded. In the second, as is the case in the industrial revolution, tools, factories, have had disruptive influences that have undermined tradition and social moral, therefore social practices. In this current period that we are born into, technopoly is seen to eliminate any alternative to itself. With reference to Postman, Orr states that “technopoly represents […] the cultural equivalent of AIDS, which is to say a culture with no defense whatsoever against technology or the claims of expertise.”[199] Based on this worldview, “Nature conceived as a distinct ontological domain has become increasingly hybridized with culture and technology and increasingly produced by human’s knowledge.”[200]

We are getting more and more embedded into the inevitability of technical system, thus into a dynamic: “Technology begets more technology.”

Second, contemporary life is shaped by the nuanced ways in which subjects and objects interact.[201] The Cartesian paradigm of use, which is structured based on the division between human subjects and their objects, does not actually represent the activities of everyday life. Merleau-Ponty states that humans are the “fabric into which all objects are woven.”[202] With reference to the example of a blind person and his stick, he asserts that “the blind man’s stick has ceased to be an object for him, and is no longer perceived for itself; its point has become an area of sensitivity, extending the scope and active radius of touch, and providing a parallel to sight.”[203] Another argument by art theorist William Mitchell is that: “We make our tools and our tools make us: by taking up particular tools we accede to desires and we manifest intentions.”[204] Allen states that “[I]t is productive to imagine artifacts as agents, enmeshed in a web or continuum with humans, acting together to co-create the complex places where we live.”[205] This perception is holistic, since instead of focusing on parts, it claims to conceive wholes, thus the various ways in which humans and non-humans, that is, technological artifacts, interact to form our environments. This view is in line with ecological worldview that supports networked knowing. In the same manner, we might argue that building assessment

“We make our tools and our tools make us: by taking up particular tools we accede to desires and we manifest intentions.”

[197] Jacques Ellul cited in Ibid., 20.
[198] Ibid., 20.
[199] Ibid., 20.
[200] Katzschner, *Sustainable Architecture, Planning and Culture - Beyond the Mechanical and Unambiguous*, 134.
[201] Barbara L. Allen, "Cyborg Theories and Situated Knowledges: Some Speculations on a Cultural Approach to Technology " in *The Green Braid: Towards an Architecture of Ecology, Economy, and Equity*, eds. Kim Tanzer and Rafael Longoria (London: Routledge, 2007), 82.
[202] Merleau-Ponty cited in Ibid., 83.
[203] Merleau-Ponty cited in Ibid., 82.
[204] William J. Mitchell, *The Reconfigured Eye: Visual Truth in the Post-Photographic Era* (Cambridge, Mass: MIT Press, 1992), 59.
[205] Allen, *Cyborg Theories and Situated Knowledges: Some Speculations on a Cultural Approach to Technology* , 88.

tools, when used as guidelines, is like sustainable design concept generators for architects.

2.3 THE REPERCUSSIONS OF THE WHOLE/LIVING SYSTEMS WORLDVIEW ON SUSTAINABILITY

The purpose of sustainability is to sustain and regenerate life enhancing conditions through holistic approaches that conceive "the evolution of the whole of the system of which we are part."

Epistemological shifts in understanding the world, which is envisioned to be "ever-changing, impermanent and inherently unpredictable process of being and becoming,"[206] would unveil profound and radical changes in our approach to the problems of sustainability. In line with ecological worldview, the purpose of sustainability is to sustain and regenerate life enhancing conditions through holistic approaches that conceive "the evolution of the whole of the system of which we are part."[207] This change in purpose leads the field of built environment to redefine its basic principles. The literature review reveals that current researchers, based on diverse research tracks, argue in favor of following this worldview in designing.[208] The study will detail these researches, which have already started to tackle design approaches based on this new paradigm which foresees architectural design from a systemic context-specific and complexity-oriented approach.[209]

2.3.1 IMPLICATIONS OF FOLLOWING THE CYCLICAL PROCESS OF NATURE AND SYSTEMS THINKING

In contrast to green design with its reductive thinking that favors technological innovations, the new paradigm framed by ecological worldview suggests following the cyclical process of nature and put emphasis on systems thinking. Hence it has three crucial implications for the conception of sustainability in the field of built environment.

2.3.1.1 FROM AN ANTHROPOCENTRIC TO AN ECO-CENTRIC WORLDVIEW

First of all to address sustainability problems, the followers of ecological worldview suggest pursuing a lifestyle, which respects the cycles of nature, and they foresee a new development model that "aligns human development efforts with the creative efforts of nature."[210] Thus such a development should respect how nature works

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[206] Du Plessis, *Towards a Regenerative Paradigm for the Built Environment*, 15.
[207] Bill Reed, "Shifting from 'Sustainability' to Regeneration," *Building Research & Information* 35, no. 6 (2007), 677.
[208] Cole, *Regenerative Design and Development: Current Theory and Practice*, 1-16.; Raymond J. Cole, "Transitioning from Green to Regenerative Design," *Building Research & Information* 40, no. 1 (2012), 39-53.; Raymond J. Cole, "Regenerative Design and Development: Current Theory and Practice," *Building Research & Information* 40, no. 1 (01/01; 2012/07, 2012), 1-6.; Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 436-449.; Simon Guy, "Designing Fluid Futures: Hybrid Transitions to Sustainable Architectures," *Environmental Innovation and Societal Transitions* 1, no. 1 (6, 2011), 140-145.; Hensel, *Sustainability from a Performance-Oriented Architecture Perspective – Alternative Approaches to Questions regarding the Sustainability of the Built Environment*, 146-154.; Pamela Mang and Bill Reed, "Designing from Place: A Regenerative Framework and Methodology," *Building Research & Information* 40, no. 1 (2012), 23-38.; Reed, *Shifting from 'Sustainability' to Regeneration*, 674-680.. Even a number of these researchers do not cite between each other.
[209] Guy and Moore, *Sustainable Architecture and the Pluralist Imagination*, 15-23.; Tanzer and Longoria, *Introduction: Networked Ways of Knowing*, 3-14.; Du Plessis, *Towards a Regenerative Paradigm for the Built Environment*, 7-22. Hensel, *Sustainability from a Performance-Oriented Architecture Perspective – Alternative Approaches to Questions regarding the Sustainability of the Built Environment*, 146-154.
[210] Du Plessis, *Towards a Regenerative Paradigm for the Built Environment*, 15.

rather than controlling nature unpinned by our predilections in our lifestyles. By reconciling humans and nature into an interacting system, **the eco-centric worldview** conceives humans as part of the nature. By consequence, it propounds the formation of an "autopoietic system where members of Homo sapiens participate in the production, transformation and evolution of the ecosystem in which they find themselves."[211] This gives humans the responsibility of not only their footprints on earth, but also the general well-being of the whole of nature, which includes them, and cautions them to be aware of the qualitative, the uncertain and the nonrational aspects of human nature, and cultural ambivalences.[212] In this sense, while designing the core objective would be the attainment of a life that enhances 'co-evolving mutualism,' that is, "the increasing and mutually beneficial integration of human and natural systems that supports their coevolution."[213]

By reconciling humans and nature into an interacting system, the eco-centric worldview conceives humans as part of the nature.

2.3.1.2 FROM COMPLICATED TO COMPLEX ADAPTIVE SYSTEMS

Based on this worldview, world phenomena can only be deciphered through holistic approach, therefore humans should become holistic thinkers. From a designer's point of view, this implies that designing should be the conception of a world comprised of not building blocks, but systems. Thus the knowledge required for designing will not be confined to the requirements of the building at hand, but it must include contextual knowledge **to weave building into the context it is found** by respecting its interaction with the neighborhood, the city or more global, the world. Opposed to the view of buildings as complicated systems, which might be reducible to their parts, Du Plessis and Cole state that:

> Complexity is introduced at the building level when the building is no longer perceived as merely a physical artefact, but rather as a process that involves interactions between natural laws, biophysical systems and the actions of their human occupants, i.e. the building is recognized as a social-ecological system in itself.[214]

In a nutshell, ecological design is seen to be the one "that fit harmoniously in an ecological, cultural, and moral context."[215] It might be reasonable to argue that this worldview has indications for the so-called debate on unity or identity in designs. Whereas the concept of unity stands for buildings designed by respecting the local context, the concept of identity identifies the buildings designed with the search of, possibly aesthetic and form considerations. The search for an identity in designs might therefore be questioned in a sense that it does not use contextual information, or rather leaves aside that information for the sake of formal predilections. This hypothetical argument will be investigated over the case study projects.

Ecological design is seen to be the one "that fit harmoniously in an ecological, cultural, and moral context."

2.3.1.3 FROM AN EQUILIBRIUM TO A NON-EQUILIBRIUM MODEL

The conception of Nature as an ever-changing system formed out of unpredictable set of processes implies that humans may accept "the inevitability of change" and

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211 Ibid., 15.
212 Ibid., 18.
213 Mang and Reed, *Designing from Place: A Regenerative Framework and Methodology*, 34.
214 Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 436-449.
215 Orr, *Architecture, Ecological Design, and Human Ecology*, 31.

reconfigure their actions with "an emphasis on adaptation and resilience"[216] to stay 'alive,' rather than the pursuit of a static system. Therefore the so-called harmony between the design artifact and its context is not in a steady-state. In contrast to the tripolar model, it is rather a progressive harmonization of dynamic systems. Instead of a static quality, this view upholds maintaining adaptiveness and the learning capability of society. From this point of view, the system has emergent characteristics, thus precluding any attempt to predict. However Mang and Reed suggest that it can still be planned and managed.[217]

2.3.2 KEY ASPECTS OF DESIGNING IN THIS NEW WORLDVIEW

So as to keep us on track with this purpose of sustainability and the above mentioned changes in approach to the built environment that call for reconnecting "human aspirations and activities with the evolution of natural systems,"[218] we, as designers, have to re-conceptualize our design questions, thus 'designerly ways of knowing' and reconfigure our design processes "that integrate social and ecosystem factors in a co-creative process."[219] To reframe the building design process in this new paradigm, Cole put forth the need to understand and reconcile a number issues: "[T]he relationship between systems thinking and reductive approaches; the relationship between the performance of individual buildings and the larger context in which they are located; and the relationship between place-/regional-specific approaches and globalized systems."[220]

2.3.2.1 PLACE / SITUATED KNOWLEDGE

Starting the design process by identifying and prioritizing the key challenges to be tackled for the specific time and place might enable to attain flexible, "situated" designs through "progressive harmonization of dynamic systems"

In line with this aspiration, researchers accept and promote 'place' as the primary starting point for designing.[221] Starting the design process by identifying and prioritizing the key challenges to be tackled for the specific time and place might enable attaining flexible, "situated" designs through "progressive harmonization of dynamic systems"[222] that positively influence or even regenerate "the social, ecological and economic health of the places," [223] where the buildings are located. Even though the poles of the tripolar model remain the same, the preceding model considers progress or development as something specifiable in advance with the intention of a steady-state design.[224] Furthermore conceiving the local environment as a system rather than building blocks would foster a holistic approach to the design process.[225] Actually this approach to place has been part of environmentalism agenda, especially in the works of grassroots followers, in the period of age of ecology, however the internationalization has unfortunately drawn this issue out of the agenda over the years.

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[216] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 439.
[217] Mang and Reed, *Designing from Place: A Regenerative Framework and Methodology*, 23-38.
[218] Ibid., 26.
[219] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 440.
[220] Cole, *Transitioning from Green to Regenerative Design*, 51.
[221] Cole, *Regenerative Design and Development: Current Theory and Practice*, 3.
[222] Mang and Reed, *Designing from Place: A Regenerative Framework and Methodology*, 34.
[223] Cole, *Transitioning from Green to Regenerative Design*, 47.
[224] Richard Rorty, *Achieving our Country : Leftist Thought in Twentieth-Century America* (Cambridge, MA: Harvard University Press, 1998).
[225] Cole, *Transitioning from Green to Regenerative Design*, 47.

Another key issue underpinned by a focus on place is related with the preservation of diversity in communities. A sustainable community means a resilient community capable of adapting to changing situations. This adaption is supported by the biodiversity and the diversity in community, as “diversity means many different relationships, many different approaches to the same problem.”[226] For human communities, ethnic? and cultural diversity is maintained by preserving diversity in communities. Therefore starting to designing from place is crucial for respecting this diversity in communities, by maintaining complexity.

Actually this focus on place draws on the discussions on the contested nature of sustainability, which is actually welcomed by a number of researchers who aim to challenge two common assumptions developed in the field. First they aim to challenge the assumption that “environment is merely a physical entity and resist the categorisation of it only in scientific terms.”[227]

Second, Guy and Moore propose a pragmatic approach to design sustainable built environments. They reject “seeing a single truth ‘out there’ and seeing all the interpretations of reality as equally true,”[228] which leads again to the same Cartesian attitude. They are against the search for consensus on design approaches to sustainability, and therefore to the standardization process. They maintain that “environmental concerns are both time and space specific and are governed by a specific modeling of nature.”[229] They are interested in the contextual specifications of problems, as also emphasized by Macnaghten and Urry:

> The reading and production of nature is something that is learnt. It is a cultural process and varies greatly between different societies, different periods and different social groupings within any society.[230]

Therefore they assume that the same logic in understanding environmental problems, which are peculiar to a place, can guide technology and sustainable architecture as well. They ultimately welcome multiple and flexible approaches to designing sustainably.

In the same manner, Guy and Moore further argue that social, political, and environmental changes would not be achieved through universal claims about progress (as in the case of modernists). They suggest abandoning such an understanding of progress and follow Rorty’s argument that calls for abandoning “the attempt **to find a (single) theoretical frame** of reference within which to evaluate proposals for the human future.”[231] They redefine progress in line with Rorty, who argues that ‘instead of seeing progress as a matter of getting closer to something specifiable in advance, we see it as a matter of solving more [local] problems.”[232] In line with this understanding, rather than a (single) ‘assessment’ framework of reference and confinement of sustainability to the performances of

They suggest abandoning such an understanding of progress and follow Rorty’s argument that calls for abandoning “the attempt to find a (single) theoretical frame of reference within which to evaluate proposals for the human future.”

[226] Capra, *Deep Ecology: A New Paradigm*, 303.
[227] Steve Hatfield Dodds cited in Guy and Farmer, *Reinterpreting Sustainable Architecture: The Place of Technology*, 140.
[228] Guy and Moore, *Sustainable Architecture and the Pluralist Imagination*, 18.
[229] Guy and Farmer, *Reinterpreting Sustainable Architecture: The Place of Technology*, 146.
[230] Macnaghten and Urry, *Contested Natures Theory, Culture and Society*, 19.
[231] Rorty cited in Guy and Moore, *Sustainable Architecture and the Pluralist Imagination*, 16.
[232] Rorty cited in Ibid., 16.

buildings as separate entities, focus on place reduces dependency on pre-packaged, universalized design solutions. Thus it does not lead to standardization.[233] In fact the proponents of regenerative design do not pursue a pragmatic approach, but still the present study foresees benefit in weaving this theory to this paradigmatic approach.

"Preserving regional identity and place-specific building practices while participating in a world culture."

Cole underlines that this focus on place could bring forth one of the prevailing conflicts in the field of architecture: "Preserving regional identity and place-specific building practices while participating in a world culture."[234] It is maintained that globalization with "the homogenizing effects of a global culture and the elimination of biodiversity"[235] collectively destroys complexity. However, Buchanan asserts that while existing cultures and settlement patterns are affected and dismantled due to globalization, actually order-making connections are still being established around the world through the new communication networks that disseminates abundant flow of information. He furthers his suggestion:

> perhaps (and hopefully) what we are witnessing is the traumatic period prior to the birth of a viable global civilisation in which networks of communication and trade will no longer be homogenizing and destructive agents but will have such abundant capacity as to allow regional peculiarities to survive and be savoured.[236]

From this point of view, Cole asserts that, while being in-between local and global, designers should draw "on the appropriately use of broader contemporary technological capabilities."[237] Even though the process emerges from the place, this worldview implies that the designer should be aware of the larger ecosystems when devising objectives for individual buildings.[238] The study will turn back to this discussion in the following chapter.

This discussion indicates that the role of the designers might shift from being a master mind or 'expert'[239] to a facilitator of a process of revealing,[240] and based on systems approach, they must be co-learners. The designer reveals the place, thus the "situated knowledge"[241] he/she is designing for.

2.3.2.2 ENGAGING STAKEHOLDERS / PARTICIPATIVE APPROACH

Revealing the situated knowledge depends on creating a common ground with diverse stakeholders.

Revealing the situated knowledge depends on creating a common ground with diverse stakeholders. While the design practice with BEATs has been valuable in fostering an integrated design process through an expansive dialogue that includes design professionals and the owners,[242] regenerative design aims at broadening

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233 Simon Guy, "Cultures of Architecture and Sustainability," *Building Research and Information* 33, no. 5 (2005), 468-471.
234 Cole, *Transitioning from Green to Regenerative Design*, 47.
235 Buchanan cited in Ibid., 47.
236 Buchanan cited in Ibid., 48.
237 Ibid., 48.
238 Maibritt Pedersen Zari, "Ecosystem Services Analysis for the Design of Regenerative Built Environments," *Building Research & Information* 40, no. 1 (2012), 62.
239 Bill Reed, "Integrated Design," in *Sustainable Commercial Interiors*, eds. Penny Bonda and Katie Sosnowchik (New York: Wiley, 2005), 26-29.
240 Du Plessis, *Towards a Regenerative Paradigm for the Built Environment*, 18.
241 Donna Haraway, "Situated Knowledge: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (1998), 575-599.
242 The study will discuss this contribution later in detail through case studies.

the dialogue by engaging the public and Nature as stakeholders. The importance of conceiving the public as a stakeholder is explained by Moore with reference to his research on the design of sustainable communities. Public engagement or "public talk," in Moore's words, reveals urban "story lines," which is ''something like a meta-conversation –a shared way of making sense of the past and speculating about what might become true in the future.''[243] It is possible to argue that the intention is not to attain an 'objective' knowledge about the place, as it would not possible, but to a gain a networked knowledge, that would better guide the making of sustainable communities, and then cities.

2.3.2.3 NEW RESPONSIBILITIES AND SKILLS

Beyond gaining familiarity with environmental strategies and blurring professional boundaries, regenerative design calls for "new ways of knowing" for becoming a systemic thinker, so as to understand this complex world. To be able to give context-specific responses, the designers might draw upon more critical, interpretative, participative approaches that would preclude being a designer of technological artifacts or dependence of them. Therefore change is needed in the mindset and values of stakeholders as well.

2.4 HOW TO INNOVATE: CONCLUDING REMARKS

The overview of the phases of environmentalism till the 2010s reveals that the mechanistic worldview is still shaping the overarching paradigm. While sustainability problems step into the scene more than ever compared to 40 years ago, we are still trying to solve problems with the same consciousness that created them. Blühdorn informs us that neither the environmental activists' calls, nor the political ecologists' reforms introduced through Conference of the Parties (COP) came to fruition, as they did not generate the required capacity for the radical structural changes, required to attain IPCC targets.[244] The calls for new a lifestyle and practices based on the belief both in the inherently alienating nature of scientific-technological-industrial modernity, and in a new life beyond a consumerist envision have evaporated. Blühdorn explains the current situation as follows:

The calls for new a lifestyle and practices based on the belief both in the inherently alienating nature of scientific-technological-industrial modernity, and in a new life beyond a consumerist envision have evaporated.

> technosceptical stances and the ecologist principle of *sufficiency* have been superseded by huge confidence in technological innovation and the principle of *efficiency*. Mass consumerism is no longer regarded as the core of the ecological problem, but is in fact, if it is green, celebrated as its most powerful solution. With its promise that technomanagerial solutions will render structural change unnecessary, the paradigm of ecological modernization has thoroughly depoliticised the ecological issue. [245]

Even though in the past designing sustainably was part of the design agenda, implicitly most of the time, nowadays there is a call for precise methods for attaining sustainable built environments. Then we are left with an outdated worldview overviewed above and with a 'new' worldview that has not yet been

[243] Steven A. Moore, *Alternative Routes to the Sustainable City: Austin, Curitiba, and Frankfurt* (Lanham, MD: Rowman & Littlefield, 2007), 11.
[244] Blühdorn, *The Politics of Unsustainability: COP15, Post-Ecologism, and the Ecological Paradox*, 36-39.
[245] Ibid., 38.

internalized as a fundamental knowledge base in our field. This new worldview thus has not yet reached its main aspirations in designing. Thayer asks the following penetrating questions:

> Can a few conspicuous solar homes, constructed wetlands, bike paths, recycling industries, wildlife habitat corridors, organic agricultural plots, and wind farms really be the key to saving the world? Isn't a much greater transformation needed in global economic, political, and social institutions?[246]

For such a transformation that would affect the course of our lifestyles and the course of designing (and therefore the paradigm) this study propounds to change the lens we use to see the world. Our current lenses unfortunately cut ourselves from the cyclical process of nature, and "we find ourselves strangers in an alien world of our own making."[247] Shifting to a worldview which considers us integral to, and interdependent with natural systems is explained to be necessary for a new sustainability paradigm, called the regenerative paradigm. A prerequisite to attain sustainable architecture, or sensible architecture, as Murcutt calls, is explained to lie in "an architecture of response, rather than an architecture that is of imposition."[248] To regain an "ecologically adapted form of life,"[249] we need to alter the way we pose questions, by the same token, we need to look for an epistemology that is suitable to know where and how sustainability in this world can be attained. In other words, "the road to an architecture of place, culture and technology is a slow process of discovery."[250]

The transition from green to regenerative design lies in changing the mindset, that is at the worldview level. Changing the worldview and the paradigm, however, requires major structural changes in the dominant construction regime and the building practices. Such a structural change requires major innovations in the way we conceive buildings and therefore cities. According to Meadows,[251] there are specific leverage points through which change within a system can most effectively be made. From minor to major impact, the list of these points is as follows:

- change parameters or numbers (e.g. quality or performance standards, numerical targets)
- the rate and structure of material flows
- nodes of material intersections
- the strength of negative and positive feedback loops
- the structure of information flows
- the rules of the system (incentives, punishments, constraints)
- changing the goals of the system
- the mindset or paradigm out of which the system arises and the power to transcend paradigms[252]

du Plessis and Cole state that current building assessment tools operate at the lower range of effectiveness.

Based on this list, du Plessis and Cole state that current building assessment tools operate at the lower range of effectiveness. In contrast, building environmental assessment tools, which will be investigated in the following chapter, is seen to be

[246] Robert Thayer, "Gray World, Green Heart," in *Theory in Landscape Architecture: A Reader*, ed. Simon Swaffield (Philadelphia: University of Pennsylvania, 2002), 189.
[247] Orr, *Architecture, Ecological Design, and Human Ecology*, 30.
[248] Glenn Murcutt, Days of ORIS Ankara 2012, May 21, 2012
[249] Pallasmaa, *From Metaphorical to Ecological Functionalism*, 74-79.
[250] Glenn Murcutt, Days of ORIS Ankara 2012, May 21, 2012
[251] Meadows cited in Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 440.
[252] Ibid., 440.

main drivers of the design of sustainable buildings in many countries, including Turkey. Especially in Turkey, the study observes that even though BEATs are designed based on green design approach, they are considered to be the representative of ‘sustainable’ design guidelines. They have a crucial role not only in defining ‘sustainable’ features of buildings but also in guiding the discourse on sustainable design.

The study argues that changing the worldview would not be possible through publications, announcements, or even convincing people to change their lenses. The change lies possibly at two levels: The change in practice, including the social practices and the building design practice, and based on the theory of multi-level perspective, at the niche-regime interactions. Therefore it is essential to investigate the role of BEATs, as a niche activity, in the design process, and the interaction between this niche practice and the overarching construction sector. Such an investigation can reveal their influence in triggering the mindset of both designers and other stakeholders, thus the public.

CHAPTER

3 ENVIRONMENTAL ASSESSMENT OF BUILDINGS

Since the 1990s significant developments that have occurred in building environmental assessment tools have brought forth new approaches to assessment in terms of indicators, assessment categories and criteria. Despite their dissemination around the world, and their attraction in marketing the projects, there are many critiques on their basic assessment methods. However, especially in Turkey, they are seen to be one of the main drivers of the concept of sustainability in the building industry. This chapter introduces the case study tools, that is, BREEAM and LEED, and conducts a review on the state-of-the-art on the critiques of these tools based on the ecological worldview. Then it correlates the implications of these tools on the architectural design processes.

By detailing the evolution of the concept of sustainability from 1960s onwards, the review in Chapter 2 discussed the implications of the shifts in how we see and then know the nature of nature on the conceptualizations of the sustainability, and therefore on the activities that deal with the consequences of environmental degradation in the field of built environment. Chapter 2 introduced that the mechanistic worldview, first developed in the Enlightenment period, has been not only the cause of environmental problems, but also the active mindset for a considerable amount of incentives for alleviating these problems. It is maintained that even though the grass roots activities of the 1960s, which mostly focused on changing the unsustainable lifestyle patterns, were based on a slightly different worldview that did not generate a groundbreaking conception of sustainability. Instead most of the current initiatives are seen to be based on the Brundtland Report.

Chapter 2 noted the importance of the Earth Summit (UN Conference on Environment and Development), held in Rio de Janeiro in 1992, in generating a common ground for discussing actions against sustainability problems. These actions have culminated in a non-binding, voluntarily implemented action plan, called Agenda 21, which set out 27 principles supporting sustainable development.

By calling "all countries to develop national sustainable development strategies," and to prepare tools that assess the impacts of built environments on Earth, this Agenda has paved the way for the proliferation of the idea of assessment of buildings.

By calling "all countries to develop national sustainable development strategies,"[1] and to prepare tools that assess the impacts of built environments on Earth, this Agenda has paved the way for the proliferation of the idea of assessment of buildings. Hence building environmental assessment tools (BEATs) is a reflection of this call. Even though the British tool, BREEAM, was developed earlier than this summit, we might presume that its dissemination and appropriation have been facilitated by this agenda.

We are currently in the midst of an important trend with the growing number of assessment tools. However initiatives like Agenda 21 did not again lead to a coherent discourse of sustainability. In view of the attempts in standardizing the design and construction processes, Chapter 2 introduced that the contested nature of sustainability has produced diverse meanings, or logics, of sustainable architecture, and thus diverse strategies to be pursued in building design. Nevertheless, the *eco-technic logic* is seen to be one of the main guides of conceptions of sustainability in architectural projects that strive to attain both efficiency in resource use and performance in the design.

In a fully connected world, assessing the contributions of one building is therefore considered quite skeptical based on this ecological worldview.

The review of the recent researches in Chapter 2 put forth the urgent need of shifting the sustainability paradigm from one framed with a mechanistic worldview to one framed by whole/living systems, that is, the ecological worldview. This new worldview is explained to represent the 'real' working logic of not only natural, but also socio-economic phenomena. As a prerequisite, such a shift would have implications on our perception of the environmental problems, thus our conceptualization of sustainability in the built environment. Recent researches, especially those pertaining to the last two years, converge on first blurring the boundaries among individual architectural projects and second extending the scale of assessment, by considering the contributions of buildings to their region. In a fully connected world, assessing the contributions of one building is therefore considered quite skeptical based on this ecological worldview. By propounding the participation of new stakeholders into project decision making processes, and by assigning new responsibilities to them, the regenerative paradigm seems to make the first sketches of a new design decision making process, thus a new practice. Adaptive, complexity-oriented projects, designed by holistic thinkers, are seen as the key for regenerating the place. Place or taking decisions based on the "situated knowledge" of the place is argued to be the key for a sustainable future.

In contrast to these calls, the mechanistic worldview that has immersed into the architectural discourse is explained to have drawn boundaries not only to the project scope, but also among the duties of practitioners. Furthermore, by drawing people's attention to the building scale, it has prepared the ground for the enactment of tools aiming to assess the environmental qualities of individual buildings. In this chapter, the study reconsiders the tripartite relationship among seeing, knowing, and doing, and argues that BEATs are a lens, for seeing sustainability in the built environment. Yet as a lens, it is underpinned by a

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[1] Andrew Smith and Michael Pitt, "Sustainable Workplaces and Building User Comfort and Satisfaction," *Journal of Corporate Real Estate* 13, no. 3 (2011), 145.

mechanistic worldview. This chapter therefore reveals the limits put by BEATs into the design strategies, therefore into the architectural practice.

Divided into four broad parts, this chapter explains the main core of the study, that is, the tools used not only for knowing the sustainability, but also for doing, that is, designing 'sustainable' buildings. The first part provides a synthesis of the key aspects and initial intentions of BEATs (3.1), and details the characteristics of BRE Environmental Assessment Method (BREEAM) and Leadership in Energy and Environmental Design (LEED) (3.2). The second part delineates the research gap in the studies concerning BEATs (3.3), and discusses the reasons for their initial success and their contributions to the building industry (3.4). The third part is a broad theoretical critique of these tools (3.5). It starts with a critique of the definition of sustainability propounded by the tools, and then proceeds to the inadequacies of BEATs in steering us towards a regenerative paradigm. It particularly discusses possible influences of these tools on architectural practices. The fourth part introduces the distinction between assessing 'product' and 'process,' and discusses the implications of BEATs on enabling market transformation.

The present study started in 2010 with the objective of foreseeing the influence of BREEAM on architectural design practice, as in 2009 the Turkish Green Building Council (ÇEDBİK) signed an alliance with BRE-Global (UK) to adapt BREEAM to Turkey,[2] and in this period the dissemination of BREAM in Turkey was higher compared to that of LEED. The adapted version of BREEAM was considered to be a primary step towards the generation of the Turkish Green Building certification tool. The decision to prepare a certification tool based on BREEAM had two important reasons. In 2008, Turkey put into force the energy regulations based the directive on energy performance of buildings (2002/91/EC), and most of the standards are taken from EU standards. Therefore the adaptation of BREEAM, rather than LEED, into Turkish context was foreseen to be beneficial. In addition, BREEAM-international pursues an assessment process based on local regulations, thus local standards. However, as foreseen as well by Duygu Erten, LEED has disseminated fast in Turkey, regarding the easiness both in passing the green assessor exam and in reaching the sources[3]. Erten's argument came to fruition in that currently there are more than 150 registered or certified LEED projects, compared to 50 projects in BREEAM (LEED certified projects: 29, registered: 130; BREEAM certified projects: 24). As mentioned in Chapter 1, LEED has become the leading assessment tool in Turkey. For this reason, even though this study does not intend to make a comparison between these tools, it aims to reveal the reasons for the dissemination of LEED in Turkey.[4]

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[2] ÇEDBİK signed this alliance on September 28, 2009.
[3] Duygu Erten, "Türkiye Için Yeşil Bina Sertifkası Ve Çözüm Önerileri," *Yapı Dergisi*, no. April (2009), 50-55.
[4] These numbers are taken from LEED project directory and BRE, Green Book Live. It is not possible to reach the number of projects in the BREEAM evaluation process as BRE announces in its website only the ones certified after the design process: Interim.

3.1 KEY ASPECTS OF BUILDING ENVIRONMENTAL ASSESSMENT TOOLS

The growing public and political awareness on climate change and environmental degradation has resulted in a host of often conflicting initiatives both at global and local scale. Despite these conflicts, there appears to be a common message conveyed in the initiatives: “significant changes were needed to mitigate environmental impact of building sector.”[5] This, by consequence, required the sector to reorient how buildings are designed, constructed, and operated.[6] Similarly, voluntarily building environmental assessment tools (BEATs) emerged as a means to respond to these requirements. By evaluating the sustainable qualities of buildings against explicitly declared criteria and providing a summary of overall performance as a rating, BEATs are envisioned to reduce the detrimental effects of construction practices on natural environment. By making these ratings public, not precisely for marketing purposes, they also demonstrate ‘good practice’ to people to raise awareness about the benefits of a sustainable built environment.[7] The number of tools has grown over the last two decades. Although their assessment process is basically the same, these tools vary to a great extant. Since the 1990s onwards, researches in developing, evaluating and comparing these tools has resulted in a variety of approaches to deal with the assessment requirements and qualities.

BEATs are envisioned to reduce the detrimental effects of construction practices on natural environment.

This study is concerned with tools:

> “that has assessment as one of its core functions but which may be accompanied by third-party verification before issuing a performance rating or label, include reference to or use of a number of tools and may offer supporting educational programmes for design professionals.”[8]

In the literature, various terms are used to denote these tools: Rating or labeling tools, systems or schemes. Again for the assessed content the literature uses: Assessment areas, aspects, issues, topics, items and dimensions. Tove Malmqvist includes more output-oriented terms as well: Environmental impacts, effects, impact categories and environmental factors.[9] Most tools structure their content through hierarchies with two or more levels, so these terms denote different hierarchical levels. For coherence, the meanings of the terms referred throughout the thesis are given below (Fig. 3-1):

Assessment (Performance) criteria: It denominates different interactions between buildings and the environment/people’s health. Each issue defines a level of performance.

Assessment (Performance) category: In the hierarchical level, assessment categories are located at a higher level that includes assessment criteria.

Assessment indicator: Assessment criteria can trigger one or more environmental impacts or health problems. To assess the impact of a problem related with a particular criterion, various indicators are defined. Indicators are

[5] Haapio and Viitaniemi, *A Critical Review of Building Environmental Assessment Tools*, 469.
[6] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 455-467.
[7] Ibid., 455.
[8] Ibid., 456.
[9] Malmqvist, *Methodological Aspects of Environmental Assessment of Buildings*, 17.

measures corresponding to the criteria. A criterion may consist of more than one indicator. Criteria and indicators are confusingly used as synonyms.[10] Happio claims that "criteria are characteristics that are considered important and by which success or failure is judged."[11] She further maintains that "[i]ndicators can be quantitative, qualitative or descriptive measures, through which when periodically evaluated and monitored, show the direction of change."[12]

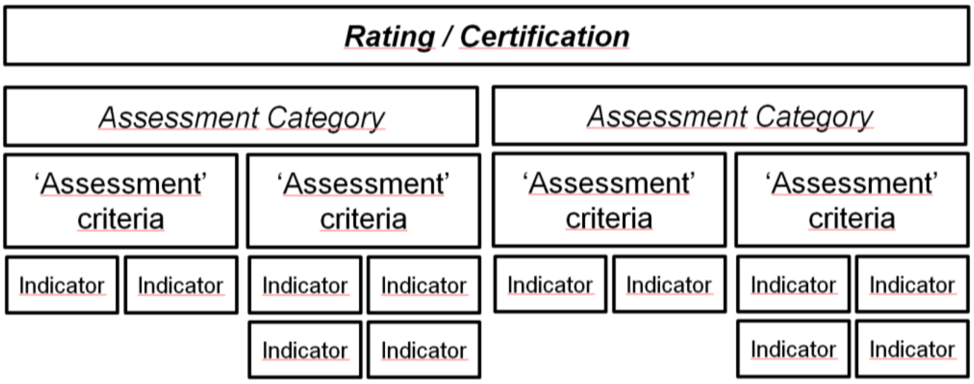

Fig. 3-1: Graphic representing of the relationship between indicators, criteria, category and rating.

3.1.1 COMPONENTS OF ASSESSMENT TOOLS

Cole divides BEATs into four components (Fig. 3-2): Assessment module (scoring, calculations, etc.), input module (data generation from assessed building), output module (presentation of results) and explanation of results (interpretation of results e.g. labeling).[13]

- The main component is the **assessment module**, in which performance scores are derived based on various environmental and social criteria. The scope of evaluated impacts, or assessed indicators, and the structure of this model tend "to form the major part of the discussion of assessment methods."[14]
- The **input module** refers to the mechanisms used for data collection: Measurements, audits, calculations, simulations, and/or estimations. This module is the main interface with the primary tool users. Actually user requirements such as simplicity, cost-effectiveness and clarity impede the real benefits of these tools, as these practical considerations with respect to data acquisition determines the number and type of environmental criteria evaluated in the assessment.[15] Therefore the complexity in the input module limits the content of the assessment module.
- The output module presents the results of an assessment. The crucial feature of this module is the weighting mechanism, which aggregates a

[10] Appu Haapio, "Environmental Assessment of Buildings" (Ph.D., Helsinki University of Technology), 11.
[11] Ibid.11.
[12] Ibid.11.
[13] Raymond J. Cole, "Building Environmental Assessment Methods: Clarifying Intentions," *Building Research and Information* 27, no. 4-5 (1999), 232.
[14] Ibid., 232.
[15] Ibid., 232.

very large number of performance criteria into a manageable and smaller number.[16] Weighting has the role of representing necessities of the local context, therefore priorities the environmental qualities that a building must be equipped with. Cole states that "[t]he output forms the basis for interpreting the assessment results and should logically dictate the structuring of both the assessment and input modules."[17]

The results, or scores, are not well detailed in these 'market-driven' tools, that is, they are not accompanied with an explanation that reconnects the score back to the input module.

- The output module provides a label or certification for assessed buildings. Such a communication can be of interest for market communication, but it is not valuable in and of itself. The results, or scores, are not well detailed in these 'market-driven' tools, that is, they are not accompanied with an explanation that reconnects the score back to the input module.[18] The score does not enable the scrutiny of strategic decisions that might be taken in the building design process or management, as intended improvements cannot be visualized with possible drawbacks or contributions to the dimensions of sustainability: Ecology, economics, social. Another key role of explanations is that they should enable a closer study of specific assessment aspects, as the tool is used by a variety of design professionals or interests. The study will recall problems pertaining to this module in the following sections.

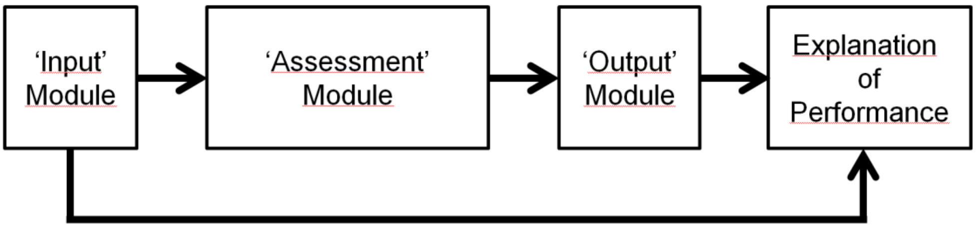

Fig. 3-2 Components of assessment tools[19]

3.1.2 INITIAL INTENTIONS OF BUILDING ASSESSMENT TOOLS

In line with the call of *Agenda 21* in developing a common ground for sharing the activities, BEATs have enabled information exchange among countries through the dissemination of projects evaluated based on 'green' performances. The following list details the initial intentions of these tools:

- They technically frame and "emphasize the assessment of resource use, ecological loadings, health and comfort in individual buildings."[20] Evaluation is actually defined as "a technical scientific procedure for expressing a judgement based on values, about the impacts of a policy or of an action on the physical (natural and/or built) environment or for assessing the effects these impacts on the community (the social dimension)."[21]

[16] Ibid., 232.
[17] Ibid., 232.
[18] Ibid., 232.
[19] Ibid., 232.
[20] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 457.
[21] Arvind Kumar, "Towards an Integrated Sustainability Assessment of the Built Environment: The Convergence of Ecological Footprint and Spatial Analysis to Map the Urban Dynamics of Sydney City" (Ph.D., The University of New South Wales), 42.

- Based on the prevention principle, they primarily focus on the mitigation: "Reducing stresses on natural systems by improving the environmental performance of buildings."[22]
- They assess performance based on the improvement of the proposed building against explicitly declared benchmarks.[23] They denote the priority of issues through weightings.
- They offer a performance summary, certificate of label, "that can be part of leasing documents and promotional documents."[24] Especially marketing of projects through these labels has become a commonplace in our era. These tools place a higher value in comparing the performances at a regional and local scale, so that building owners and developers has the possibility to demarcate a marketing 'edge' in their competition.[25]

With respect to these initial intentions, Malmqvist summarizes three broad application areas of these tools:[26]

- **Internal management of existing buildings** (To improve the environmental performance of the existing building stock)[27]
- **Design guidelines** (Informing decision-makers and specifying environmental targets during the design stages)[28]
- **Market communication** (Delivering 'objective' measurements of a building's environmental performance).[29]

The study focuses on two types of use: Their use as ***design guidelines*** and ***market communication***. First, BEATs are not developed as design guidelines that provide knowledge on designing sustainably, but as assessment tools for buildings. Nevertheless in the absence of better alternatives they have become as such for designers seeking to integrate environmental issues into design decisions.[30] Therefore, it is crucial to make a research on how design decision making processes are influenced by the lens provided by BEATs and how the hidden assumptions about the ways leading to a sustainable future of BEATs is communicated to the designers. Second, currently, the practice with BEATs is a niche activity in the building industry. Therefore revealing the role of this niche activity in shifting the dominant construction regime towards a sustainable path through market communication is crucial.

BEATs are not developed as design guidelines that provide knowledge on designing sustainably, but as assessment tools for buildings.

[22] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 457.
[23] Cole, *Building Environmental Assessment Methods: Clarifying Intentions*, 233.
[24] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 457.
[25] Cole, *Building Environmental Assessment Methods: Clarifying Intentions*, 233.
[26] Malmqvist, *Methodological Aspects of Environmental Assessment of Buildings*, 23-27.
[27] Ibid.23-27Drury Crawley and Ilari Aho, "Building Environmental Assessment Methods: Applications and Development Trends," *Building Research & Information* 27, no. 4-5 (07/01; 2012/07, 1999), 300-308.
[28] Malmqvist, *Methodological Aspects of Environmental Assessment of Buildings*, 23-27.Crawley and Aho, *Building Environmental Assessment Methods: Applications and Development Trends*, 300-308.
[29] Malmqvist, *Methodological Aspects of Environmental Assessment of Buildings*, 23-27.Lützkendorf and Lorenz, *Using an Integrated Performance Approach in Building Assessment Tools*, 334-356.
[30] Crawley and Aho, *Building Environmental Assessment Methods: Applications and Development Trends*, 300-308.; Haapio and Viitaniemi, *A Critical Review of Building Environmental Assessment Tools*, 469-482.

This focus stems from the core argument of the thesis. By defining standards for an environmentally sensitive building, BEATs assess the final product. They are developed neither for assessing, nor for guiding the process. However when used as guidelines they would naturally invoke a particular type of design process or practice. To attain sustainability in built environment, the study argues that it is not important whether a building is sustainable, or environmental, or not. What is essential is their possible role in changing practices and making new configurations in the overall sector. In a similar vein, Raymond Cole states that

> it is not a question of creating methods that can describe performance more accurately, it is one of acknowledging the potential to change and positively influence the current mental models, attitudes and priorities of multiple stakeholders involved in the production of the built environment.[31]

If, by any means, processes with BEATs disseminate in the field, we would probably be able to see changes in the production of built environments. Then with respect to the problems stemming from their use as design guidelines and their assessment scheme, the study investigates whether any particular limitation is put onto the design process, which precludes attaining context-specific, complex and adaptive designs, deemed essential to gain multiple perspectives on designing sustainably.

3.2 OVERVIEW OF BUILDING ENVIRONMENTAL ASSESSMENT TOOLS: BREEAM AND LEED

Understanding the major characteristics of BREEAM and LEED is necessary to foresee how they interact with design practices of professionals. The following review of tools is divided into two parts: ‘General organization’ and ‘structure and assessment.

3.2.1 BRE ENVIRONMENTAL ASSESSMENT METHOD (BREEAM)

While BREEAM Europe Commercial 2009 is currently used to certify projects in Turkey, the review of BREEAM is made based on its new version ‘BREEAM 2011 New Construction,’ because a new international scheme might be developed based on this new one and a newer version represents the current approach to assessment.

3.2.1.1 GENERAL ORGANIZATION

First launched in 1990 in the UK, BREEAM is defined as the first attempt to “establish comprehensive means of simultaneously assessing a broad range of environmental considerations in buildings.”[32] Currently there are more than 200.000 BREEAM certified buildings.[33] BREEAM defines its aims as follows:

> To mitigate the life cycle impacts of buildings on the environment
> To enable buildings to be recognised according to their environmental benefits

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[31] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 464.

[32] Crawley and Aho, *Building Environmental Assessment Methods: Applications and Development Trends*, 300-308.

[33] BRE Global Ltd., *BREEAM New Construction, Non-Domestic Buildings Technical Manual SD5073-3.0:2011*, 2012).

To provide a credible, environmental label for buildings
To stimulate demand for sustainable buildings[34]

We might presume that except for the first aim, which directly acts as a vehicle for pursuing sustainability, the remaining three directly refer to the market audience. BREEAM 2011 specifies the principles underlying the tool as follows:

1. Ensure environmental quality through an accessible, holistic and balanced measure of environmental impacts.
2. Use quantified measures for determining environmental quality.
3. Adopt a flexible approach, avoiding prescriptive specification and design solutions.
4. Use best available science and best practice as the basis for quantifying and calibrating a cost effective performance standard for defining environmental quality.
5. Reflect the social and economic benefits of meeting the environmental objectives covered.
6. Provide a common framework of assessment that is tailored to meet the 'local' context including regulation, climate and sector.
7. Integrate construction professionals in the development and operational processes to ensure wide understanding and accessibility.
8. Adopt third party certification to ensure independence, credibility and consistency of the label.
9. Adopt **existing industry** tools, practices and other standards wherever possible to support developments in policy and technology, build on existing skills and understanding and minimize costs.
10. **Stakeholder consultation** to inform ongoing development in accordance with the underlying principles and the pace of change in performance standards (accounting for policy, regulation and market capability).[35]

Based on the whole/living systems worldview, the section "How they define sustainable architecture," will carry out a critical review of the principles underlying both BREEAM and LEED.

3.2.1.2 STRUCTURE AND ASSESSMENT

The table below summarizes the major characteristics of BREEAM, such as phases of assessment, objective, international application of BREEAM.

	BREEAM 2011
Schemes	**New Construction:** • Commercial (Offices, Industrial, Retail) • Public (non housing) (Education, Healthcare, Prisons, Law Courts) • Multi-residential accommodation / Supported living facility (Residential institutions: Residential care home, sheltered accommodation, residential colleges/schools, military barrack) • Other (Residential institutions: Hotel, hostel) • Non-residential institutions (Art gallery, museum, library) • Assembly and leisure (Cinema, theater/music/concert hall, exhibition/conference hall) **Communities** **In-use** **EcoHomes**

[34] Ibid., 2. In order to give an accurate picture of what design professionals see on the document, these aims are taken directly from the original document.
[35] Ibid., 2

	Refurbishment (Domestic, Non-domestic) **Code for Sustainable Homes**
Objective	Rating
Phases of assessment	Design Stage (DS) and Post-Construction Assessment (PCS) by trained and licensed BREEAM Assessors. DS assessment is carried before starting the operations on site. The certificate given at this stage, Interim BREEAM Certificate, cannot be considered as the final BREEAM performance. The final assessment is undertaken after the completion of construction. There are actually two types of assessments at this stage: (1) In case there is an interim certificate, the completed building is verified whether it complies with the interim design assessment; (2) in case there is no prior interim certificate, a full assessment procedure is followed.
Scale	Building Level
Approach (Assessment module)	Algorithmic, Substantive, Systemic: The building gains credit when it satisfies with the requirements defined in the criteria. For each category, the achieved credits are compared to the available ones and a score is attained. Each category score is weighted and the scores are added to attain the total score. Rating benchmarks are used to label the building for its environmental impact.
Scope (Assessment module) [36]	Multi-criteria assessment Management, Health and Wellbeing, Energy, Transport, Water, Materials, Waste, Land Use and Ecology, Pollution, Innovation
Indicators (Input module)	For global, local and indoor issues
Number of credits	Up to c. 150 credits depending on building type
Minimum standard	Tab. 3-1
Weighting (Output module)	Tab. 3-2
Output / ratings	Pass, Good, Very Good, Excellent, Outstanding
International application of the tool	BRE has alliances with a number of countries that generate country specific versions of BREEAM based on the core method of BREEAM-UK. According to these alliances, there are a number of issues, including different infrastructures, to be reconsidered for country specific schemes, just to name a few: Weightings, cooling strategy & energy consumption, type of renewable technologies, capacity to recycle waste, capacity to cycle to and from buildings, different construction practices that may impact on risk of legionellosis contamination.[37] There is also the possibility to use BREEAM, BREEAM Bespoke, for a project outside UK.
Implicit epistemology	Positivist. The use of benchmarks and simulations tools, it is believed that the predictions are objective and can guide the designers.

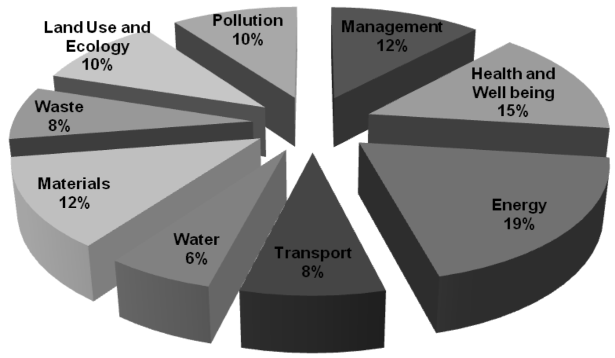
Tab. 3-1: BREEAM Minimum standards

[36] A detailed list of assessment criteria per categories can be found in the appendices.
[37] Virginia Cinquemani, "BREEAM on an Internation Level," BRE, http://www.bre.co.uk/filelibrary/virginia_cinquemani_-_breeam_international_introduction.pdf (accessed May, 10, 2010).

No.	Criteria	P	G	VG	E	O
Man 1	Sustainable procurement	1	1	1	1	2
Man 2	Responsible construction practices	-	-	-	1	2
Man 4	Stakeholder participation	-	-	-	1**	2**
Hea 1	Visual comfort	1*	1*	1*	1*	1*
Hea 4	Water quality	1*	1*	1*	1*	1*
Ene 1	Reduction of CO2 emissions	-	-	-	6	10
Ene 2	Energy monitoring	-	-	1***	1***	1***
Ene 4	Low or Zero Carbon Technologies	-	1	1	1	2
Wat 1	Water Consumption	-	1	1	1	2
Wat 2	Water Monitoring	-	1*	1*	1*	1*
Mat 3	Responsible Sourcing	1****	1****	1****	1****	1****
Wst 1	Construction Site Waste Management	-	-	-	-	1
Wst 3	Operational waste	-	-	-	1	1

* Criterion 1 only
** Building user information
*** First submetering credit
**** Criterion 3 only

Tab. 3-2: BREEAM Assessment category weightings



Assessment Category	Weighting (%)
Management	12
Health and Well being	15
Energy	19
Transport	8
Water	6
Materials	12,5
Waste	7,5
Land Use and Ecology	10
Pollution	10
TOTAL	100
Innovation (additional)	10

3.2.2 LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)

3.2.2.1 GENERAL ORGANIZATION

The first LEED Pilot project program, LEED v 1.0, was launched by US Green Building Council (USGBC) in 1998. Updated versions with the years are as follows: LEED v 2.0 in 2000, LEED v 2.1 in 2002, LEED v 2.2 in 2005. The current version LEED v.3 is in use since 2009 and in Turkey new buildings are certified with this version. For the project registration and certification, project teams use the tool through an online system LEED-Online with Green Building Certification Institute (GBCI), which was established in 2008 as a separately incorporated entity with the support of the USGBC.

LEED Green Building Rating Systems is a voluntary, consensus-based, and market-driven evaluation tool. LEED defines its aims as follows:[38]

> Based on existing and proven technology, they evaluate environmental performance from a whole building perspective over a building's life cycle, providing a definitive standard for what constitutes a green building in design, construction, and operation. The LEED rating systems are designed for rating new and existing commercial, institutional, and residential buildings. They are based on accepted energy and environmental principles and strike a balance between known, established practices and emerging concepts. [39]

3.2.2.2 STRUCTURE AND ASSESSMENT

The table below summarizes the major characteristics of LEED, such as phases of assessment, objective, international application of LEED.

	LEED v.3 2009
Schemes	• New Construction and Major Renovations, Schools • Existing Buildings: Operations & Maintenance • Existing schools • Commercial Interiors • Core & Shell • Retail • Healthcare • Homes • Neighborhood Development
Objective	Rating
Phases of assessment	Design Phase Review & Construction Phase review by GBCI. The team must decide to have a split or combined review. For the split review, if the certification decision is taken early in the design phase, the project is sent to review and "GBCI formally rules on the design phase application by designating each attempted credit as either anticipated or denied."[40] This phase does not guarantee the awarding of the LEED certification. It only helps project teams to foresee possible achievement of credits. For the final review, the team resends all attempted credits for

[38] In order to give an accurate picture of what design professionals see on the document, these aims are taken directly from the original document.
[39] U.S. Green Building Council, *LEED Reference Guide for Green Building Design and Construction*, 2009), xii.
[40] Ibid., xix

	review, including the new attempted credits. GBCI makes the final review and takes the decision to certify or not. If the team follows combined review, the team sends the documents for preliminary review. After receiving the preliminary review response, they send the responses to this review. Based on these responses the final review is made by GBCI. GBCI sends the final review decision. If the project team disagrees with any assessment, they appeal at a cost of 500$. If the team accepts the decision, the certificate is issued.
Scale	Building Level
Approach (Assessment module)	Heuristic: The building gains credit if it satisfies the requirements defined in the criteria. The sum of the credits gained from the constituent criteria determines the rating of the building.
Scope (Assessment module) [41]	Multi-criteria assessment Sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation and design process, regional priority
Indicators (Input module)	For global, local and indoor issues
Number of credits	110 credits
Minimum standard	The prerequisite criteria are equal for all ratings and the project must satisfy them all. From these criteria, the project does not gain points (Tab. 3-3).
Weighting (Output module)	There is no weighting applied to the number of credits. "All LEED credits receive a single, static weight in each rating system; there are no individualized scorecards based on project location."[42]
Output / ratings	Certified, Silver, Gold, Platinum
International application of the method	Currently LEED is one of the widespread assessment tools used internationally. Problems stemming from international use of LEED: Regional priority credits become problematic for countries which do not have an adapted version of LEED. As there is no weighting, it is not possible to reflect regional requirement specific to a region.
Implicit epistemology	Positivist

Tab. 3-3: LEED Minimum standards

Assessment Category	**No.**	**Assessment Criteria**
Sustainable Sites	Prerequisite 1	Construction Activity Pollution Prevention
	Prerequisite 2	Environmental Site Assessment
Water Efficiency (WE)	Prerequisite 1	Water Use Reduction
Energy and Atmosphere (EA)	Prerequisite 1	Fundamental Commissioning of Building Energy Systems
	Prerequisite 2	Minimum Energy Performance

[41] A detailed list of assessment criteria per categories can be found in the appendices.
[42] Ibid., xiii U.S. Green Building Council, "LEED Project Directory," U.S. Green Building Council, http://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx (accessed March, 8, 2013).; U.S. Green Building Council, *LEED Reference Guide for Green Building Design and Construction*

	Prerequisite 3	Fundamental Refrigerant Management
Materials and Resources (MR)	Prerequisite 1	Storage and Collection of Recyclables
Indoor Environmental Quality (IEQ)	Prerequisite 1	Minimum Indoor Air Quality Performance
	Prerequisite 2	Environmental Tobacco Smoke (ETS) Control

3.3 THE EARLY SUCCESS AND THE MAJOR CONTRIBUTIONS OF THE TOOLS

Prior to these tools, there were any means to discuss and evaluate building performances in such a comprehensive manner.

Based on the argument introduced in Chapter 2, it is not possible to conceive the rationale that has prepared these tools as completely wrong. Delving straightforward to the critiques would lead us to dismiss the major contributions of BEATs, as well as the possibility of integrating their partial truths. Understanding the assessment mechanism requires a look into the contextual factors that have contributed to the early success of these tools. Prior to these tools, there were no means to discuss and evaluate building performances in such a comprehensive manner. So there was a gap, a distinct niche, in the field, especially in an emerging European and North America 'culture of performance assessment.'[43]

Solutions to environmental problems, as argued in Chapter 2, require a systemic approach. However these tools address these problems in a seemingly simple list, according to which buildings must address a limited number of performance measures. The dissemination of these tools is explained to be fostered owing to a key characteristic of the building industry: "[I]t is risk averse and prefers simple, unambiguous messages regarding what to do rather than why it should be done."[44] Therefore their success lies "in their perceived simplicity in declaring an industry expectation of what constitutes 'green' building design and construction."[45] This recognizable structure for addressing environmental issues has thus easily got into the fore of the debates on building environmental performance.[46] Public-sector building agencies have started to put into force these tools to show their concern to the emerging environmental policies and directives. The building industry, mainly based on a capitalist regime that is in the pursuit of economic growth, has started to use them to gain a distinct role in the game for marketing purposes.

These tools have emerged as a response to the demands on reducing the overall environmental impacts of built environment on nature, by also enhancing human social requirements. Their increasing applications have provided considerable theoretical approach and practical experiences on ways to attain environmentally responsible building practices. These tools actually represent a synthesis of current environmental knowledge related to buildings, so they have played a key role in

[43] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 456.
[44] Ibid., 462
[45] Ibid., 463
[46] Ibid., 456

gathering the research community onto a common ground.[47] Cole states that their primary contribution to date "has clearly been to acknowledge and institutionalize the importance of assessing buildings across a broad range of considerations beyond established single performance criteria such as energy."[48] These tools have put forth that addressing this broad range of issues can only be achieved by the integration of all the interested parties in designing, through a greater communication and cooperation, thus teamwork. Above all, these tools raised awareness about the benefits of sustainable design. Despite the diversity in interest, developers, owners and occupants have all realized the contributions of certified buildings. To this end, by maintaining the relationship between buildings and the environment very much in line with the qualities of the industry, BEATs have contributed significantly to the conception environmentally sensitive building practice.

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3.4 CRITICAL REVIEW OF BUILDING ENVIRONMENTAL ASSESSMENT TOOLS

3.4.1 RESEARCHES ON TOOLS: A RESEARCH GAP

The literature review reveals the following research tracks on assessment tools:

- Overview and comparison of tools in the market, with reference to their framework, structure and actors[49]
- Comparison of assessment results of different tools and differences in design solutions, impact of assessment criteria on designing[50]
- Development of new multi-criteria approaches to assessment[51]
- Enhancing assessment criteria and process[52]

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[47] Cole and Larsson cited in Cole, *Building Environmental Assessment Methods: Clarifying Intentions*, 231.

[48] Ibid., 231

[49] Maike Buttler and Christian Stoy, "Comparing the Benefit of International Assessment Methods" (Stockholm, ERES Conference, 24 - 27 June, 2009). Thomas Saunders, "A Discussion Document Comparing International Environmental Assessment Methods for Buildings," BRE, http://www.dgbc.nl/images/uploads/rapport_vergelijking.pdfRichard Reed et al., "International Comparsion of Sustainable Rating Tools," *JOSRE*, no. 1 (2009), 1-22.Haapio and Viitaniemi, *A Critical Review of Building Environmental Assessment Tools*, 469-482.. Saleh H. Alyami and Yacine Rezgui, "Sustainable Building Assessment Tool Development Approach," *Sustainable Cities and Society* 5, no. December (12, 2012), 52-62.Maria Sinou and Stella Kyvelou, "Present and Future of Building Performance Assessment Tools," *Management of Environmental Quality: An International Journal* 17, no. 5 (2006), 570-586.Joel Ann Todd et al., "Comparative Assessment of Environmental Performance Tools and the Role of the Green Building Challenge," *Building Research and Information* 29, no. 5 (2001), 324-335.

[50] W. L. Lee and J. Burnett, "Benchmarking Energy use Assessment of HK-BEAM, BREEAM and LEED," *Building and Environment* 43 (2008), 1882-1891.Ya Roderick et al., "Comparison of Energy Performance Assessment between LEED, BREEAM, and Green Star" (Glasgow, Scotland, Eleventh International IBPSA Conference, July 27-30, 2009).S. Thomas Ng, Yuan Chen and James M. W. Wong, "Variability of Building Environmental Assessment Tools on Evaluating Carbon Emissions," *Environmental Impact Assessment Review* 38 (2013), 131-141.Marita Wallhagen and Mauritz Glaumann, "Design Consequences of Differences in Building Assessment Tools: A Case Study," *Building Research and Information* 39, no. 1 (2011), 16-33.Carmela Cucuzzella, "Design Thinking and the Precautionary Principle: Development of a Theoretical Model Complementing Preventive Judgment for Design for Sustainability Enriched through a Study of Architectural Competitions Adopting LEED" (Ph.D., Université de Montréal), .Guy R. Newsham, Sandra Mancini and Benjamin J. Birt, "Do LEED-Certified Buildings Save Energy? Yes, but…," *Energy and Buildings* 41, no. 8 (8, 2009), 897-905.

[51] Grace K. C. Ding, "Sustainable construction—The Role of Environmental Assessment Tools," *Journal of Environmental Management* 86, no. 3 (2, 2008), 451-464.

[52] Ewelina Kaatz et al., "Advancing Key Outcomes of Sustainability Building Assessment," *Building Research and Information* 34, no. 4 (2006), 308-320.

- Epistemological approaches to the assessment modules and their underlying image of sustainability[53]
- Developing regionally specific environmental building tools,[54] adaptation of existing tools into another context,[55] the use of international tools in other countries[56]
- Transition to the assessment of neighborhoods[57]
- Case study research on certified projects[58]

Based on this review, critical points about these tools underlined by these researches are as follows: The impossibility of comparing the efficiency of buildings labeled in different methods as there is no consensus on weighting of criteria given for the same requirements; the influence of regional peculiarities and exigencies on assessment systems; formulation of referential, or rather, baseline assumptions; inefficiency in enabling optimum project selection; complexity of the tools; evaluating quantitative and qualitative criteria concurrently.

This review brings forth the lack of a practice-based research in this field that uses both social practice theory (SPT) and multi-level perspective (MLP) to discuss the influences of these tools on real-practice routines, especially in the context of international use of these tools. Furthermore, the field has not yet internalized what might be the implications of the ecological worldview on these tools and on architectural practice.[59] To the best of the author's knowledge, there is currently no research that discusses the contributions of BEATs to the designers' routine practices and to the overarching socio-technical system of built environment in terms of enabling the transition to a sustainable built environment.

Disclosing the implications of BEATs on architectural practices and the socio-technical system of built environment necessitates a synthesis of both the drawbacks of BEATs and the critiques based on an ecological worldview. Thus how the buildings are conceived from the lens provided by BEATs is central to this synthesis. The present study divides this synthesis into three sections:

- The definition of sustainability (Section 3.4.2)
- Epistemological critique of tools based on whole/living systems worldview (Section 3.4.3)

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53 Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 436-449.; Cole, *Transitioning from Green to Regenerative Design*, 39-53.
54 Hikmat H. Ali and Saba F. Al Nsairat, "Developing a Green Building Assessment Tool for Developing Countries – Case of Jordan," *Building and Environment* 44 (2009), 1053-1064.Nils K. Larsson, "Development of a Building Performance Rating and Labelling System in Canada," *Building Research and Information* 27, no. 4 (1999), 332-341.Yu Liu et al., "Developing Regionally Specific Environmental Building Tools for China," *Building Research and Information* 34, no. 4 (, 372-386.
55 W. L. Lee and J. Burnett, "Customization of GBTool in Hong Kong," *Building and Environment* 41 (2006), 1831-1846.
56 Varun Potbhare, Matt Syal and Sinem Korkmaz, "Adoption of Green Building Guidelines in Developing Countries Based on U.S. and India Experiences," *Journal of Green Building* 4, no. 2 (2009), 158-174.
57 Kumar, *Towards an Integrated Sustainability Assessment of the Built Environment: The Convergence of Ecological Footprint and Spatial Analysis to Map the Urban Dynamics of Sydney City*
58 Zukowski, *From Green to Platinum: LEED in Professional Practice*
59 Peter Clegg, "A Practitioner's View of the 'Regenerative Paradigm'," *Building Research & Information* 40, no. 3 (2012), 365-368.Katie Williams, "Regenerative Design as a Force for Change: Thoughtful, Optimistic and Evolving Ideas," *Building Research and Information* 40, no. 3 (2012), 361-364.Joseph A. Tainter, "Regenerative Design in Science and Society," *Building Research & Information* 40, no. 3 (2012), 369-372.

- Assessment tools or design tools: Problems pertaining to the use of these tools as design guidelines and problems pertaining to the characteristics of these tools: Scale of measurement and communicating results (Section 3.4.5)

3.4.2 ASSESSMENT TOOLS: HOW THEY DEFINE SUSTAINABILITY?

The tripolar model, without an definitive framework, is explained to have been one of the main guides of researches on sustainability. The lack of consensus on the framework and the lack of tools or methods of investigation seem to preclude the tripolar model to define a paradigm. Thus the perception of the architects is guided by a loose gestalt. This looseness is a good sign for changing the current mechanistic paradigm, which defined the model as well. However assessment BEATs provide a tool.[60]

The tripolar model seems to be materialized in the form BEATs, which has disseminated how to design sustainably along the assessment criteria, by also becoming part of the architectural discourse. Acting as discursive elements, their rules seem to govern the appearance and existence of the definitions of sustainability.[61] Chapter 2 indicates that institutions are essential on the formation of the discourse as well as its appropriation with the knowledge and the powers they carry.[62] The study argues that institutions like USGBC and BRE, through the dissemination of their understanding of sustainability ingrained in these tools, hold the power to determine which aspects of buildings have to be assessed and how.

Institutions like USGBC and BRE, through the dissemination of their understanding of sustainability ingrained in these tools, hold the power to determine which aspects of buildings have to be assessed and how.

In Chapter 2, the study introduced the contested nature of sustainability and revealed that there might not be a single path towards sustainable built environment. The scientific knowledge, produced through mechanistic, in other words deterministic approach, conceptualizes the complexity of environmental problems with certainty. However, Cole argues that

> [i]f change and uncertainty are, according to the notion of complex systems, the only certainty one may have then it is clearly necessary to make this much more explicit in strategic building design decisions and the tools used to assess their success.[63]

So the interaction between building constructions and the environment, both natural and cultural, is still largely unknown and solutions to complex problems require systems thinking, which escapes the assessment logic of BEATs.[64] In this sense, in line with Guy and Moore, this study argues that a pluralist approach to designing may flourish the “making of green-knowledge” in the field of architecture. The study argues that we may not limit ourselves with labeling best practices or dependence on universalized model, but instead we may look for diverse

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[60] Işıl Ruhi-Sipahioğlu, "How to Achieve Sustainability in Architecture? an Account on the Limitations of Environmental Assessment Tools" (Konya, Turkey, Selcuk University, November 15-16, 2012).
[61] Foucault, *The Archeology of Knowledge and the Discourse on Language*, 30.
[62] Ibid.
[63] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 440.
[64] Ding, *Sustainable construction—The Role of Environmental Assessment Tools*, 452.

examples, which are produced in different contexts with different ways of practicing sustainable architecture.[65]

Nevertheless, in the BREEAM document, it is argued that:

> [BREEAM] sets the standard for *best practice in sustainable* design and has become the de facto measure used to describe a building's environmental performance. [emphasis added] [66]

The LEED document however recedes from defining sustainability and argues that:

> [b]ased on existing and proven technology, [LEED] evaluate environmental performance from a whole building perspective over a building's life cycle, providing a *definitive standard for what constitutes a green building in design, construction, and operation*. [emphasis added][67]

Even though the tools are based on robust technical standards, which are argued to be credible, herein lies three crucial problems. First, their definition of sustainability is biased towards the environmental pole. Even though they include social aspects, such as indoor air quality, acoustic performance, thermal and visual comfort, they do not touch upon "the situated knowledge of a context," thus cultural aspects. The economic contribution of a building is not assessed. Actually assessing social and economic aspects still remain problematic in the field. LEED details the economic and environmental issues related with each criterion; nevertheless it presumes that the environmental criteria are of primary concern.

Compared to BREEAM Europe Commercial 2009, BREEAM UK New Construction 2011 includes the cultural issues, at least under the criterion 'stakeholder participation.' One key indicator included in this criterion is the consultation that suggests that designers include relevant parties, such as building users, existing community or community under construction, maintenance contactors into the design process. So BREEAM incorporates the local knowledge into process; nevertheless it is only a minimum standard for projects seeking excellent or outstanding rating levels. Only the preparation of the building user information, which provides details about the functions and uses of the building to ensure the efficient use of the building, is foreseen as a minimum requirement.[68] The design problem is divided into its parts so a partial solution to sustainability is gauged.

Second, as mentioned above weightings, decided by the scientific boards, are influential in determining the impact of buildings on environment. Both BREEAM and LEED declare a set of environmental issues and assign significance to them through weightings. Even though LEED 2009 uses the "U.S. Environmental Protection Agency's TRACI environmental impact categories as the basis for weighting each credit," it underlines that "[c]redit weights also reflect a decision by

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[65] Guy, *Pragmatic Ecologies: Situating Sustainable Building*, 21-28.; Guy and Moore, *Sustainable Architecture and the Pluralist Imagination*, 15-23.; Guy, *Pragmatic Ecologies: Situating Sustainable Building*, 21-28.; Guy, *Designing Fluid Futures: Hybrid Transitions to Sustainable Architectures*, 140-145.

[66] BRE Global Ltd., *BREEAM Europe Commercial 2009 Assessor Manual*, 2012), 8.

[67] U.S. Green Building Council, *LEED Reference Guide for Green Building Design and Construction*, xii.

[68] BRE Global Ltd., *BREEAM New Construction, Non-Domestic Buildings Technical Manual SD5073-3.0:2011*, 49-57.

LEED to recognize the market implications of point allocation."[69] The BRE Global "Sustainability board" has the role of overseeing BRE Global's guides, publications, standards and certification schemes in the area of sustainability and the environment.[70] BREEAM does not explicitly share their vision on this issue and states that the weightings are derived from a combination of consensus and ranked by a panel of experts.[71]

BEATs introduce a highly structured tripolar model with weightings. Then designers might "see" the problems with a very strong gestalt, so that they might, for the sake of efficiency, loose the chance to respond to place, based on regional design considerations and practices. Furthermore international application of LEED and BREEAM might not be able to address the necessities of local contexts, as such LEED for US and BREEAM for UK. However it is highly questionable how complex regional, social and cultural variations can be maintained in a simple deterministic approach. Even further, while construction codes and standards are essential for determining the baseline building for benchmarking, BREEAM Europe 2009 suggests following local codes, but LEED uses the US standards, regardless of its application in diverse countries. For the development of green knowledge, the present study argues in favor of attaining multiple perspectives of designing sustainably and again suggests closing down ways of standardization. Unfortunately BEATs see the problem from a very short-sighted perspective, which might lead to standardizations of design solution. As will be explained in chapter 5 as well, certified buildings in Turkey built over the last 2 years seem to incorporate to some extent very similar design features. Regional design considerations and practices are seen to be relinquished for the sake of efficiency.

The second problem is related with possible design alternatives proposed by these tools. They seem to guide designers into a track that leads designers to include a number of "sustainable features" into their projects, such as bicycle facilities, on-site renewable energy production with photovoltaics, and green roofs. Currently in the field of built environment, there is still no consensus on the indicators or on the categorization of environmental issues. Even though the apparent clarity of BEATs has been valuable for the building sector, as will be maintained later in this section, "rigid categorization can be counter to the need to acknowledge and resolve links and synergies."[72] Therefore this might lead to standardized design solutions, instead of looking for alternatives. In Chapter 6, the study, through case study projects certified in Turkey, will detail how assessed buildings foresee very similar design solutions to gain credits for reaching a desired label. Presumably, use of these tools precludes fostering innovation in design, when used as the sole guide.

A third problem is related with the international use of these tools and explained by Cole as follows:

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[69] U.S. Green Building Council, *LEED Reference Guide for Green Building Design and Construction*, xiii.
[70] BRE Global Ltd., *BREEAM Europe Commercial 2009 Assessor Manual*, 8.
[71] Ibid., 23
[72] Raymond J. Cole et al., "Issue Paper: Building Environmental Assessment Tools: Current and Future Roles" (Tokyo, World Sustainable Building Conference 2005, 27-29 September, 2005).

> [T]he inappropriate cross-cultural 'importation' of specific technical strategies may, in the short-term, prove potentially detrimental to environmental progress. Similarly, since assessment methods invariably carry the implicit cultural biases of their creators, it is critical that their underpinnings be made explicit within any comparison and adoption.[73]

Green-washing might occur if the internationally used tools underestimate contextual exigencies, local environmental, social, economic problems, of a particular country or even a region.

Moreover, as is the case with BREEM and LEED in Turkey, when several tools appear in the same market and with similar claims for ascertaining sustainability but use differing methodologies and assign different ratings for the same building, this can become problematic for users."[74] If there is little consensus on sustainability at the local context, concurrent appearance of these tools might "undermine confidence and allow gaming and 'green-washing' of building products, technical products, and even complete architectural projects."[75] Green-washing might occur if the internationally used tools underestimate contextual exigencies, local environmental, social, economic problems, of a particular country or even a region. This could even cause public distrust in these tools and then in sustainable building practices.[76] The overview of BREEAM and LEED indicates that both tools institutionalize a particular and "limited definition of environmentally responsible building practices at a time when exploration and innovation should perhaps be encouraged."[77] Then the following parts details what might be the limitations put onto practice.

3.4.3 SEEING, KNOWING WITH ASSESSMENT TOOLS

To understand the implications of the lens which is provided by these tools to the design professionals in practice, the study again refers to the methodology explained in chapter 2: Seeing, Knowing, and Doing (Fig. 3-4). The study first explains the problems pertaining to the seeing and knowing domains of BEATs and it relates the implications of these two domains to doing domain, that is, how the assessment is done and then how the design process guided by BEATs evolves.

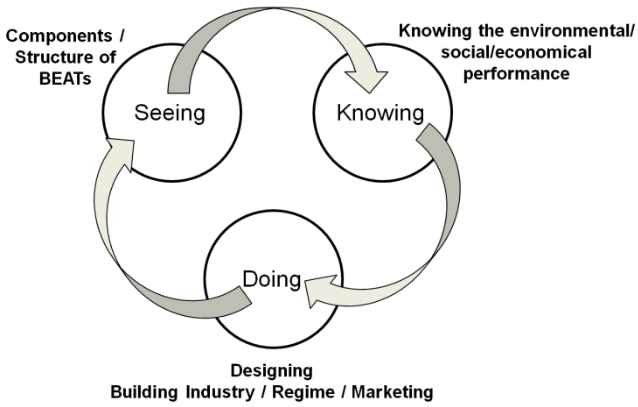

Fig. 3-3: The methods used to make the analysis of BEATs

[73] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 458.
[74] Wallhagen and Glaumann, *Design Consequences of Differences in Building Assessment Tools: A Case Study*, 17.
[75] Ibid., 17
[76] Ibid., 17
[77] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 463.

Based on this approach, the study is guided by the following questions:

- How do BEATs see the world?
- How do BEATs know the world?
- How do BEATs address the world through assessment?

Based on the whole/living systems worldview, this critical review of BEATs is limited to their implications on design decision making process.

3.4.3.1 ANTHROPOCENTRIC WORLDVIEW

Regarding their unclear emphasis of on both environmental and social emphasis, BREEAM and LEED seem to be implicitly based on an a*nthropocentric* worldview. This however sets two problems.

First, BEATs assess social aspects by a tool developed for assessing 'green' buildings. Green connotes with buildings that reduce their footprint on earth, then acoustic problems or daylighting would not be part of such an assessment. Then this is an epistemological misinterpretation. However if we 'see' environmental or ecological sustainability as "the protection of resources and the protection of the ecosystem,"[78] or based on the perspective of the regenerative paradigm, as the regeneration of the environment, 'knowing' the impact of the building on nature would be through "a common quantitative framework […] given by the analysis of energy flow and mass flows in time and space."[79] Therefore for the 'doing' domain, the well-known Life-Cycle Assessment (LCA) tools are more appropriate for this purpose. However by including design quality indicators (DQI), BEATs disguise "the real mass and energy flows, which determine the effective environmental impact."[80] This impact is further concealed by the way achievements are communicated. In BEATs, the credits gained from the constituting criteria are weighted and aggregated into a single score. Even though record sheets represent the credits gained from each category, it is the last degree that matters: Gold, platinum, very good… Therefore the communicated result does not mean that the design solution address and supports its ecological context.

Including DQI such as, thermal and visual comfort, water quality, into tools actually indicates the growing demand from the field in embracing a broad range of considerations rather than assessing only building performances, in terms of especially efficiency in energy use. However through the introduction of the DQI, BEATs define a boundary between humans and nature as well and do not encourage designers to think that we are actually bound to nature. This does not mean that the evaluation of social and especially economical aspects by these tools is completely wrong. Presuming human above or equal to nature in the assessment seems to be wrong, because it might cause a distraction from the question of our limits on earth.

[78] Niklaus Kohler, "The Relevance of Green Building Challenge: An Observer's Perspective," *Building Research and Information* 27, no. 4-5 (1999), 317.
[79] Ibid., 317.
[80] Ibid., 317.

These tools focus just on improving buildings in terms efficiency and performance, they do not challenge human comfort expectations, occupants' practices, thus lifestyles.

Second, researches indicate that changes in life patterns, building use, time intervals, expectations, knowledge, behavior, and therefore in sum practices have correlations with energy consumptions of buildings.[81] However these tools focus just on improving buildings in terms efficiency and performance, they do not challenge human comfort expectations, occupants' practices, thus lifestyles. By doing so, they define a certain type of occupant behavior and accept the current status-quo of humans. This problem is at the core of the most groundbreaking, I argue, manifesto ever published in the field of sustainable design that call for altering the anthropocentric conception of sustainable design. To redefine what might be the role of design professionals and inhabitants in face of urgency in addressing climate change, this manifesto published by the participants of PLEA 2009 conference frames first the following five conditions:

- Considering the current urgency for carbon reduction to counteract climate change and that the building sector alone accounts for 40% of the world's energy use and the resulting carbon emissions,
- Considering that absolute comfort is a privilege, not a right and that comfort is a relative state strongly dependent on the liberty to choose,
- Considering that the overall mechanization of architecture has led to a disconnection between the occupants and the building,
- Considering that a dynamic and responsible interaction between inhabitants and architecture can lead to important energy and carbon reductions, and consequently
- **That buildings do not consume energy, inhabitants do through the medium of architecture** [emphasis added].[82]

By "seeing" occupants as passive agents, BEATs detach human actions from buildings, without leaving any purposeful role to humans. Even further they are based on the belief that humans have predictable traits and activities. One of the key factors in calculating energy demands of buildings is the assumptions made on occupancy rate to foresee thermal comfort (if foreseen), day lighting, consumptions of lightening, the use of elevators, etc. In regard to the advancements in the field of soft computing, highly accurate estimations are made in predicting energy demands of buildings. By doing so, they do "see" occupants who have predictable behaviors, and whose needs are unquestionable and must be fulfilled as far as possible. However this understanding, that is the conception of humans as predictable beings, underestimates the interaction between human lifestyles, or practices, and buildings. In fact, post occupancy evaluations (POE) of a number of certified buildings indicate that performances calculated by simulations are not parallel to the real performances of the buildings. Newsham *et al.* underline that this might be due to the unforeseen occupants' use, rather than the inaccuracy of the simulation tools that evaluate energy consumption based on probabilistic occupancy rates.[83] In fact, "seeing" humans as active inhabitants would bring about numerous benefits, which will be explained in various occasions in the study. To solve these problems, "the PLEA delegates assembled in Québec City from 22-24

[81] Heather Chappells and Elizabeth Shove, "Debating the Future of Comfort: Environmental Sustainability, Energy Consumption and the Indoor Environment," *Building Research and Information* 33, no. 1 (2005), 32-40.; Elizabeth Shove, "Putting Practice into Policy: Reconfiguring Questions of Consumption and Climate Change," *Contemporary Social Science: Journal of the Academy of Social Sciences* (2012), 1-15.
[82] Passive and Low Energy Architecture, "(PLEA)-2009 Conference Website," http://www.plea2009.arc.ulaval.ca/En/Manifesto.html (accessed November 29, 2012).
[83] Newsham, Mancini and Birt, *Do LEED-Certified Buildings Save Energy? Yes, but…*, 897-905.

June 2009 to debate on Architecture, Energy and the Occupant's Perspective propose"[84] suggest five directives that must be put into force:

- Communities should provide comfortable and healthy outdoor environments sustaining the applicability of passive environmental strategies such as daylighting, passive heating and cooling,
- Buildings should provide their inhabitants with several adaptive opportunities optimizing health, satisfaction and productivity,
- Inhabitants should be responsible to take an 'active' role for the provision of relative comfort using robust 'passive and low energy' strategies,
- Pre and post occupancy evaluations in new and existing buildings should become mandatory steps within the integrated design process to accelerate our understanding of the systemic inhabitants-architecture interactions, and
- Professionals, educators and developers should reconsider the design and building process as an opportunity for the rehumanisation of architecture through inhabitants' increased autonomy rather than automation.[85]

These directives are seen to be in line with the whole/living systems worldview. They suggest conceiving adaptive buildings, rather than pursuing automated technological fixes to reduce energy consumption. They call designers to re-conceptualize their approach to social practices, therefore to the conception of human beings, on which the three assumptions are active: Humans as predictable beings, humans as passive agents, and humans' needs must be fulfilled. These assumptions will be explained with reference to the criteria on thermal comfort.

3.4.3.2 INTERACTIONS AMONG BUILDINGS AND HUMANS

Specifications about thermal comfort are seen to be one of the most controversial topics in building science.[86] It is true that human can live within certain ranges; they die if it is too hot, cold, wet or dry, but people have reported feeling comfortable even ranging from 6^{o} to 30^{0}C.[87] This means there are different parameters to comfort than temperature. As maintained Chappells and Shove, comfort is also dependant on culture and convention.[88] Researchers studying comfort in different regions, indicate that thermal comfort and adaptability highly correlate with people's native regions.[89] Also outdoor temperature influences people's thermal adaptability. This indicates that thermal comfort level might change dependent on regions. Despite the differences in the perception of thermal comfort, international application of, for example, LEED becomes problematic, as it is based on ASHRAE Standard 55-2004 developed for US. BREEAM Europe Commercial suggests using local codes and in case of absence of standard the EN ISO 7730:2005 standard must be used.[90] For Turkey, this is again problematic as there is no local code. Standardization in comfort then leads to the design of strict comfort bands.

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[84] Passive and Low Energy Architecture, *(PLEA)-2009 Conference Website*
[85] Ibid.
[86] Fergus Nicol and Ken Parsons, "Editorial: Special Issue on Thermal Comfort Standards." *Energy and Buildings* 34, no. 6 (2002), 563-572.
[87] Nicol et al. cited in Chappells and Shove, *Debating the Future of Comfort: Environmental Sustainability, Energy Consumption and the Indoor Environment*, 33.
[88] Ibid., 33.
[89] Bin Cao et al., "Field Study of Human Thermal Comfort and Thermal Adaptability during the Summer and Winter in Beijing," *Energy and Buildings* 43 (2011), 1051-1056.
[90] Ergonomics of the thermal environment — Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria.

Researches on peoples' general thermal adaptation methods point out that even though there are many alternatives for achieving comfort, people, especially in built environments, are prone to choose the one depending on their prior experiences.[91] For example, when people who have worked for a considerable time in an office building equipped only with A/C and without window openings move into office with window opening, they adapt their thermal comfort by turning on the A/C if there is any.[92] This reflects not only the relationship between the features of buildings and people's habits gained over the years of habitation, but also give clues about the role of architects in triggering these habits.

'Seeing' humans as predictable and objectively knowable subjects reflects onto the doing domain as oversimplified standards, on which there is still no consensus. Edward Arens discusses the uncertainty about the effects of tightly air-temperature controlled space based on real perceived comfort and suggests considering "classifying [buildings] in terms of their energy use in providing occupant comfort."[93] Shove *et al.* suggest introducing more subjective issues related to occupants, such as perception, interaction, and socio-cultural context. These suggestions indicate an ongoing change of perspective in the field.[94] Humans' activities, explained to be highly dependent on context, are not so much predictable as assumed to be. To this end, it might be argued that even though people living in a certified building, which also has a building user guide, might not follow the instructions, for example, not opening windows during a certain period. It is true that current intelligent building control systems regulate thermal conditions or lightening amount based on certain levels, e.g. fresh air rate based on CO_2 level, lightening level with respect to daylighting, thermometers, but they also allow human control on specific zones, so they allow for possible changes in these base conditions. The contribution of intelligent buildings in reducing energy consumptions is unquestionable, but we may argue that they consider human agency as a destructive force. In line with this approach Cole asserts that:

> Human agency adds a level of uncertainty and unpredictability that conventional comfort studies have attempted to minimize by designing and implementing systems that either eliminate the need for human intervention due to increasingly high levels of automation or dictate permissible occupant actions under pre-set conditions.[95]

What is deemed conventional is actually at the heart of assessment tools. Their criteria seem to lead to certain design solutions that call for intelligent systems, while leaving room for human control. Probably natural ventilated buildings elude this problem, but if the window openings are controlled by pre-set systems, then human agency is dismissed again. Calculations on lighting level represent a similar

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[91] Ruey-Lung Hwang et al., "Thermal Perceptions, General Adaptation Methods and occupant's Idea about the Trade-Off between Thermal Comfort and Energy Saving in hot–humid Regions," *Building and Environment* 44, no. 6 (2009), 1128-1134.
[92] Ibid.
[93] Edward Arens et al., "Are 'Class A' Temperature Requirements Realistic Or Desirable?" *Building and Environment* 45 (2010), 10.
[94] Elizabeth Shove et al., "Comfort in a Lower Carbon Society," *Building Research and Information* 36, no. 4 (2008), 307-311.
[95] Raymond J. Cole et al., "Re-Contextualizing the Notion of Comfort," *Building and Environment* 36, no. 4 (2008), 329.

case, but at least there seems to be consensus on certain levels. However an automated system is also active while turning on and off the lights. In this case, humans are only passive agents and buildings are like second nature to human.

Another key issue about practices is explained by Chappells and Shove as follows:

> What is deemed possible and what is and is not up for negotiation relates to a range of other conventions about what buildings should contain and what they should look like. These are anything but static. Office air-conditioning has become increasingly common in the UK, not necessarily for reasons of comfort, but because it constitutes one amongst other signifiers of 'quality' and prestige. This process of normalization is one in which estate agents, valuers and property developers play at least as important a role as clients and end-users.[96]

This example on the image of air-conditioning and expected comfort levels is related with humans' expectations about comfort, so about their practices. Obviously expectations, or images, about a hospital, an office and especially a house highly differ from each other, so they are not the same for all types of buildings.[97]

To address the imperatives of climate change, in line with recent researches in the field,[98] the study calls for shifting the conception of humans from passive to active agents, redefining "the scope of what building inhabitants consider 'comfortable' indoor environment,"[99] and re-conceptualizing design principles in a way that attempt to alter social practices. Engaging inhabitants in adapting to changing indoor environmental conditions implies that inhabitants will interact with buildings. *This approach might trigger changes in lifestyles*. Instead of standardized conditions in indoors throughout the year,[100] people should accept seasonal variety, and then look for suitable clothing for coping with hot or cold temperatures. For example, the program called 'Cool Biz,' launched by Japanese government in 2005, introduced a flexible dress code, which allowed people to get dressed in, for example t-shirts, in hotter months of the years. It is documented that such an institutional flexibility has resulted in an estimated 1.4 million tonnes-reduction in CO_2 emissions.[101]

To address the imperatives of climate change, in line with recent researches in the field, the study call for shifting the conception of humans from passive to active agents.

BEATs do not call for possible changes in our lifestyle, as they are based on accepted range of comfort. Actually the study herein focused on thermal comfort, but the issue of comfort correlates as well with modes of transportation, the use of hot water, even planting grass in gardens for the sake of pleasure or image of grass. The credits in reducing water consumption are gained through the use new taps or flushes. Occupants might continue their life without even noticing that they

[96] Chappells and Shove, *Debating the Future of Comfort: Environmental Sustainability, Energy Consumption and the Indoor Environment*, 37.
[97] Ibid., 37.
[98] Cole et al., *Re-Contextualizing the Notion of Comfort*, 323-336.; Shove et al., *Comfort in a Lower Carbon Society*, 307-311.; Chappells and Shove, *Debating the Future of Comfort: Environmental Sustainability, Energy Consumption and the Indoor Environment*, 32-40.
[99] Cole et al., *Re-Contextualizing the Notion of Comfort*, 329.
[100] Having the same temperature throughout the year is unhealthy for humans who need changing conditions.
[101] Shove, *Putting Practice into Policy: Reconfiguring Questions of Consumption and Climate Change*, 6.

are living in a 'green' building. Therefore, BEATs do not challenge "any existing entrenched powers or privileges, institutional reforms and technological advance."[102] They only perpetuate the old paradigm.

LEED and BREEAM conceive building occupants, humans, as rational agents, when given proper indications they will follow them by heart.

LEED and BREEAM conceive building occupants, humans, as rational agents, when given proper indications they will follow them by heart. This is well exemplified, the study argues, in the hope of guaranteeing best performances by controlling the building use patterns through the preparation of 'building user guide,' which is a minimum criteria worth one credit. However it might not be usually the case.

As one of the influential researchers in the sociology of human agency, Habermas underlines his optimism of human capacity for positive change, or constant improvement. Cole *et al.* explain Habermas's optimism as follows: "Habermas claims that contemporary society is experiencing a decreasing rate of positive change, perhaps even a reversal that is precipitated by a high level of structure and thus a restriction on human improvization."[103] In fact, improvisation is crucial in circumstances, for which there is no prior set of response. Cole *et al.* argues that "improvization creates space for new expectations and dispositions to emerge, but it does not occur in a vacuum."[104] Improvizations enhance innovation patterns. Even though they diverge from each other, social practice theories share an agreement, which is that human actions are shaped and constrained by social and cultural fields, or structures.[105] Socio-cultural change occurs very slowly, because according to social practice theorists, humans continuously (re)produce the existing social and cultural structures, thus experiences. These structures change when individuals and groups express agency. Based on this theory, the study criticizes BEATs for not enhancing improvisations, not attributing an active role to inhabitants, thus not enabling innovation in practices. In fact, in BREEAM for example stakeholder participation has just been introduced into its 2011 version, but it is not again a minimum requirement. It might be argued that BEATs reproduce the existing worldview, thus the existing conception of humans.

Based on an eco-centric worldview, the assessment might be based on the assessment of the support of buildings in enhancing sustainable patterns of living and designing. Then the challenge of such an assessment lies in changing the prevalent values of all the stakeholders, including the inhabitants of buildings. Based on the new paradigm:

> The framing of the discussion of building design as inseparable from place carries the implication that it is equally, if not more important, to understand how building design, construction and use positively influence the social, ecological and economic health of the places they exist within. This is clearly different from green building practice that focuses on the performance of the building as a separate entity.[106]

Engaging inhabitants opens the possibility for improvisation, thus changes in practices, because the sole focus on technological improvements might not yield

[102] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 461.
[103] Cole et al., *Re-Contextualizing the Notion of Comfort*, 330.
[104] Ibid., 330.
[105] Giddens, Bourdieu
[106] Cole, *Transitioning from Green to Regenerative Design*, 47.

the required shift for transition to a sustainability paradigm framed by eco-centric worldview.

Herein the study explained the importance of shifting the relationship between human/building relationships. To summarize, Chappells and Shove, based on Foucault, state that "theories of comfort and associated technological solutions themselves reflect and reproduce contrasting formulations of socio-technical power."[107] Lifestyles are shaped by social and cultural structures. Changing these structures, thus the reproduction of social practices, along with the image associated with practices, is actually one of the major drivers of this study. The study suggests changing these structures by changing occupants' practices. Then envisioning new practices would require new practices for designers as well, in terms new values, skills, expectations. The following chapter is therefore devoted to explain first social practice theory referred in this context and second how practices with BEATs deviates from '(re)produced' practices of the profession, because as in the case comfort expectations, especially architects' practices are shaped by socio-cultural and profession specific structures. This is the reason why the study examines the design process of certified projects based on SPT and MLP that will be detailed in Chapter 4.

3.4.4 PART/WHOLE RELATIONSHIP

Chapter 2 explained in detail the repercussions of the whole/living system worldview on 'seeing' nature, for example, the redefinition of the relationships between parts and wholes. The examination of LEED and BREEAM reveals that they both divide the impacts of the whole (buildings) into the impacts of parts (components), without focusing on the interdependencies among these parts. Moreover by focusing on the individual buildings, they do not consider the interdependencies between the other buildings that make up a much bigger whole (world). They seem to foster a design process made of a collection of detached activities. In fact, this mechanistic worldview reflects at two scales in the field of architecture, as illustrated below (Fig. 3-5):

1. How a building is conceived: The sum of building parts (components) defines the whole (building).
2. How a built environment (local) is conceived: The sum of parts (buildings) defines the whole (neighborhood, region, global).

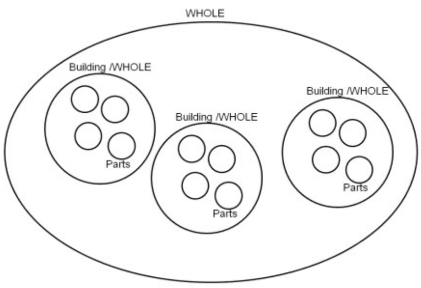

Fig. 3-4: Figure representing the assessment logic espoused by tools

[107] Chappells and Shove, *Debating the Future of Comfort: Environmental Sustainability, Energy Consumption and the Indoor Environment*, 37.

This division in logic can be read from the three primary 'dimensions' of BEATs, which are Scale, Time, and Criteria.[108] Cole explains the relationships between these dimensions as represented in Fig. 3-6. Both tools define a number of boundaries along the continuum of these dimensions. However the whole/living systems or ecological worldview sees the built environment from a broader scale (Fig. 3-7). It implies that designers should see nature, or rather world, as a holistic and fully connected entity, starting from components up to the global scale and focusing on the interdependencies along this continuum (Fig. 3-8). This approach, by consequence, requires blurring all the boundaries put in-between the following dimensions: Building/Local/Global, humans/ecology, and short term/long term.

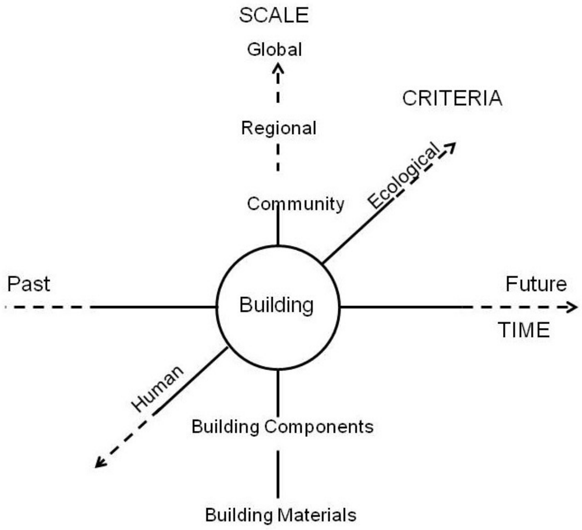

Fig. 3-5: The three dimensions of environmental assessment as represented by Cole/ Scale, Time, and Criteria.[109]

Even saying that there exist dimensions is to define boundaries, but this is only a way to explain how buildings are considered as self-regulating components detached from self-regulated world. The following part of the study discusses the limitations of BEATs that might hamper the pursuit of this new worldview. The study first explains the impact of the part-whole divisions on these dimensions and then proceeds with the problems within the input and assessment modules, which again perpetuates this part/whole division.

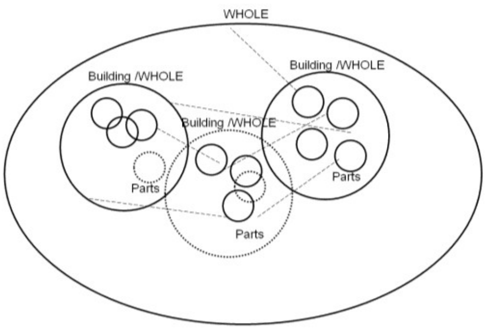

Fig. 3-6: Figure representing the representation of built environment based on whole/living systems worldview

[108] Cole, *Building Environmental Assessment Methods: Clarifying Intentions*, 230-246.
[109] Ibid., 239.

3.4.4.1 SCALE

The qualities assessed by BEATs are seen to be parallel to the program areas defined in *Agenda 21-Chapter 7: Promoting Sustainable Human Settlement Development*, except that Agenda 21 encompasses a broad range of issues concerning social and economical dimensions of built environment, owing to its focus on urban settlements. By accentuating the essentiality of cultural diversity in settlements, the program looks for possible contributions of individual buildings to their socio-economic contexts. This broad scope seems to be absent in the formulation of these tools.

BEATs assess the performances of individual buildings. It presumes that to make buildings sustainable separately would bring about a sustainable community. Conceiving buildings as single entities detached from their place "preclude a more complex understanding of how architectures may arise from and engages in more complex relations over time."[110] Seeing the built environment as a complex system, understanding linkages across a range of scales, and thus the contributions of buildings to their contexts and to the services required by society, however, can nurture a symbiotic mutually supportive built environment.

BEATs assess the performances of individual buildings. It presumes that to make buildings sustainable separately would bring about a sustainable community.

A systemic approach is a prerequisite to address the links between building, community and region. The new worldview, based on a holistic approach, propounds to blur these boundaries across scales. This means each new design instance is fed by a new relationship, stemming from regional priorities. As such, each building is a node in a huge complex network then,

> Instead of assessing performance against a set of indicators corresponding to pre-determined sustainability criteria . . . urban assessment systems will be concerned with monitoring the resilience and adaptive capacity of the social–ecological system and building assessment systems will focus on the building's contribution to the resilience of the larger system'[111]

3.4.4.2 TIME

The time dimension, which is explicitly covered with life-cycle methodologies, is again a very controversial aspect in tools. Researches consider LCA as the only legitimate basis on which to compare alternative materials, components, and services.[112] While BREEAM strictly requires life cycle assessment for materials, LEED only indicates that LCA can be performed while making material choices. There are a number of uncertainties while the team performs a life-cycle analysis, such as how long the building will be used (It is suggested as 60 years in BREEAM), how long it will perform the same function, how many people will use this building…[113] The present study argues that life-cycle analysis is full of assumptions made about the future life of the building. We might therefore argue that life-cycle analysis has as well a human dimension, and this brings forth the importance of having a shared vision about the life of the building, as this

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[110] Hensel, *Sustainability from a Performance-Oriented Architecture Perspective – Alternative Approaches to Questions regarding the Sustainability of the Built Environment*, 148.
[111] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 445.
[112] The analysis of life-cycle costs is seen to be indicated in tools as well, owing to its impact on economical pole.
[113] Haapio and Viitaniemi, *A Critical Review of Building Environmental Assessment Tools*, 479.

correlates especially with the maintenance frequency. Moreover, BEATs "focus primarily on operational carbon instead of the emissions generated throughout the entire building life cycle."[114] Again while choosing for example floor finishing materials, factors like durability is again dependent into some extent on human practices.

These uncertainties are balanced through the comparison of life-cycle costs and life-cycle impact of materials. Then for example BREEAM 2011

> requires a 60 year study period for the purpose of compliance with this assessment issue to align with the BRE Green Guide to Specification, which uses a 60 year period for quantifying the environmental impacts of building specifications and their replacement components. Therefore, using a 60 year study period allows longer life components to be compared to shorter life components on a cost versus environmental impact basis.[115]

In this specification we observe that the balance between economical and environmental poles depends on the decisions of stakeholders. The major objective is seen to be efficiency in resource use; however such a confinement of design alternatives has major drawbacks, if design product is foreseen to foster long-term sustainability.

3.4.4.3 CRITERIA

The criteria dimension has already been discussed above, while arguing that these tools are based on an anthropocentric worldview, as they include both ecological concerns (resource use, ecological loadings etc.) and human concerns (indoor environmental quality, economics etc.). Then tools put a boundary between humans and nature. Another problematic issue about this dimension is the assessment of performance criteria. As the review of BREEAM and LEED indicates, these tools include both quantitative and qualitative criteria. Although quantitative ones –annual energy, water consumption, green gas emissions, etc.– can easily be evaluated based on consumption amounts, the qualitative ones (that is, impact on ecological land, impact on local wind) can only be evaluated on a feature specific basis, where the points or credits are given in case the project has or has not the required features. Then these criteria are open to wider interpretation and there is uncertainty in their assessments, which are carried out by external assessors.[116] Ding underlines that it is these qualitative criteria become decisive in environmental issues.[117] Furthermore, as the range and nature of criteria included in different assessment tools differ one from another, it becomes problematic to compare buildings rated in different tools.

With reference to the discussions in Chapter 2, these tools can be conceived in the mechanistic paradigm due to the belief in gaining knowledge about impacts with certainty. To know the impact or possible prospects of reduction means to trust the results generated over the simulation programs. In an uncertain and truly

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[114] Ng, Chen and Wong, *Variability of Building Environmental Assessment Tools on Evaluating Carbon Emissions*, 131.
[115] BRE Global Ltd., *BREEAM New Construction, Non-Domestic Buildings Technical Manual SD5073-3.0:2011*, 61.
[116] Cole, *Building Environmental Assessment Methods: Clarifying Intentions*, 239.
[117] Ding, *Sustainable construction—The Role of Environmental Assessment Tools*, 457.

connected world, how the priority given over weightings is established therefore becomes problematic. They assess performance based on the improvement of the proposed building against explicitly declared benchmarks, rather than proximity to a defined, desired goal. However the benchmarks are declared based on 'typical' practice conforming to local regulations. There is no target performance level.[118]

3.4.5 DESIGNING WITH BEATS AND DOING THE ASSESSMENT

BEATs act in a checklist manner to demonstrate whether a building meets certain requirements and the final performance is "aggregation of the points obtained within the constituent environmental credits. As such, the selection of the performance credits is based on ensuring their independence to avoid the possibility of "double-counting."[119] Thus tools see each problem separately, and then define criteria separately. It is this networked relationship among a tremendous number of criteria that define a project to be sustainable. In reality decision-making is rarely based on a single dimension. In designing, architects compare the design solutions against a number of criteria, so they need "a multi-perspective that takes into account a spectrum of issues regarding a development."[120] This is also included in tools as suggestions to design professionals, but when these criteria are represented in the form a checklist, this might undermine the rigor of design decisions as it might lead to conforming to each criterion separately. Given the lack of intense prerequisite criteria that a project must comply with, in BREEAM and LEED it is possible to obtain a grade if the effort is only focused on particular categories. These tools presume a certain kind of efficiency oriented approach. A good or a very good certificate does not mean that the building pushes the edge towards an environmental project. The consequence of this problem is seen to result in point-chasing in practice. This study will touch upon this issue in Chapter 6 in the context of the case study projects. The examinations put forth that almost all the criteria are somehow related to each other. In BREEAM for example, the criterion security is related to external lightings, external lightings to ecological land use and to the energy consumption. This chain continues and renders the impossibility to separate one criterion from another. This problem impedes BEATs as a guide for selecting the optimum project options.

BEATs see each problem separately, and then define criteria separately.

A detailed examination of BREEAM Offices 2008 held in 2010 by the author demonstrates possible interactions among assessment criteria (Tab. 3-5).[121] LEED version 2009 accounts the interdependences among various criteria. Along with the complexity of the tools, however, it might be correct to argue that synergies among the criteria are lost to the architects. These problems in seeing the world undermine the possibility of achieving sustainability goals. From a systemic point of view, the interdependencies preclude defining strict boundaries between assessment criteria so the relative importance of one criterion over others is far

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[118] Cole, *Building Environmental Assessment Methods: Clarifying Intentions*, 233.
[119] Cole, *Building Environmental Assessment Methods: A Measure of Success*, 7.
[120] Ding, *Sustainable construction—The Role of Environmental Assessment Tools*, 458.
[121] BREEAM 2011 is seen to have included these interrelations among criteria, but only in the written format.

beyond being determined. The importance however does not lie in the criterion; instead it is directly located in-between the boundaries. The study assumes that environmental or sustainable assessment tools become meaningful through an integration of all the criteria, not only one to another, but an integration of all the aspects should be considered. In regard to the remarks of Cole on the issue of uncertainty, the criteria should be envisioned flexibly, along with a suitable basis that enable their interactions. Further studies are needed to foresee these relationships according to which emergent interactions, which could result in unexpected outcomes.

Furthermore all criteria are assumed, thus represented, as if they are of equal importance. There is no order of importance for criteria. Weightings either explicitly or implicitly are inherent in the tools. Being at the heart of all assessment tools, it dominates the overall performance score of the assessed building. Actually weighting is implicit in LEED, as each criterion is worth one credit. However the relative importance of performance criteria is essential while making design-decisions if the stated objectives are to be achieved. This might undermine an in-depth understanding of the environmental impact of building.[122]

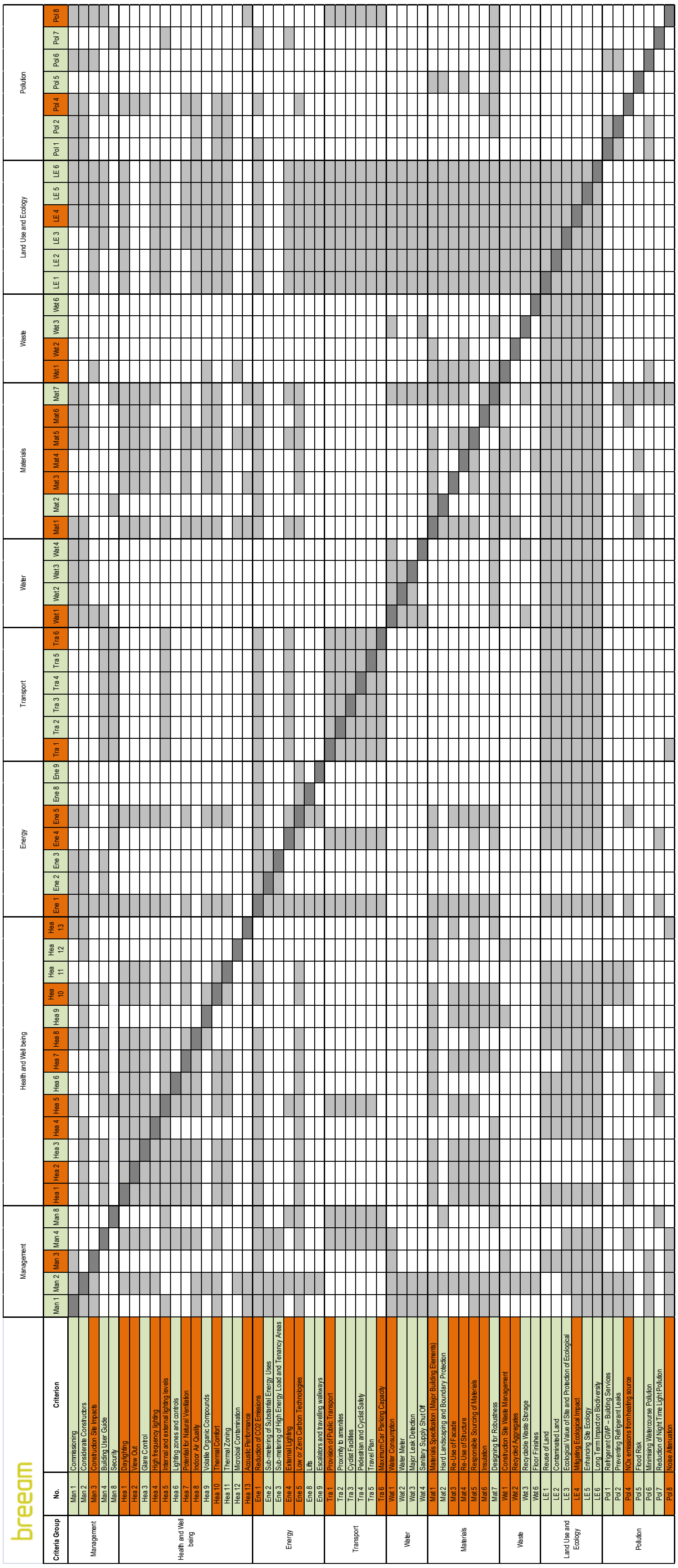
As mentioned in Chapter 2, based on the ecological worldview, for each architectural project, sustainability may not be found at the middle of tripolar model. Stakeholders have to decide how each criterion makes sense in their context, in view of their limitations. From another perspective, especially in Turkey, certified buildings are built majorly by private companies or corporate agencies. This requires a focus on the sustainability of organizations and why these organizations are seeking certifications for their buildings as well. Ding states that:

> For an organisation to be sustainable it must be financially secure, minimise the negative environmental impacts resulting from its activities, and conform to societal expectations (Elkington, 1997; Roar, 2002). The triple bottom line concept underlies the multiple-dimensional evaluation process of development. To conform with the concept, a business to be sustainable, must deliver prosperity, environmental quality and social justice.[123]

Actually the simplicity of these assessments is explained to be one of the main reasons for their dissemination and appropriation in the building industry. In fact without a multi-criteria perspective how professionals integrate these very crucial environmental impacts into their decisions is highly contestable. This question will be investigated in the case studies, given the importance of owners in the selection of criteria.

[122] Ibid., 458.
[123] Ibid., 459.

Tab. 3-4: Table representing the possible interdependencies and synergies among performance criteria in BREEAM Offices 2008



3.4.5.1 ASSESSMENT TOOLS OR DESIGN TOOLS

In the absence of better alternatives to BEATs, design professionals are increasingly using BEATs as design guidelines

It is now well known that in the absence of better alternatives to BEATs, design professionals are increasingly using BEATs as design guidelines.[124] There are various problems pertaining to this use. As has been previously stated, however, LEED, BREEAM, CASBEE, and SBTool are all prepared to assess the final product, not the process. They give component knowledge about the characteristics of green buildings in the form of criteria that include specs about materials, simulation tools, benchmarks, etc. On the other hand, by providing prospects, they also touch upon issues on the design and construction processes. Nevertheless if looked closely these processes are primarily defined for gaining credits in an assessment category. They are confined to the criteria. In this sense, LEED APs or BREEAM assessors, or consulting firms should act as key managers in properly guiding the process so as to enhance a holistic approach to designing.

Traditionally, raising the quality of industrially produced products was meant to raise the performance level in the final product test. Actually it is now well understood that the final quality of a product lies in its design process and production. For the building industry Kohler claims that:

> The quality assessment of the final product, a complete building, can be of interest to a developer who wants to sell a building or to a buyer who wants to choose between high quality products.[125]

This might be one of the reasons why developers strive to certify their buildings for marketing purposes. The traditional approach does not equip the architects with prospects needed in the design process, as it does not allow "to answer the relevant question (with the appropriate level of detail) at the right moment."[126] Even more, as mentioned above, these tools adopt a particular definition of sustainability that dominates the assessment module, which incorporates criteria based on the 'scientific belief' of experts. On this issue, Cole claims that

> since environmental assessment methods present an organized set of selected environmental criteria, by default they communicate to building owners and design teams what are understood as being the most significant environmental considerations.[127]

This understanding might limit design alternatives and it might also underestimate local exigencies of a particular site, especially when these tools are used internationally. In case designers follow the worldview espoused by BEATs, this problem would probably disseminate into design solutions. As their definition of sustainability is biased towards the environmental pole, they leave aside social and economical sustainability. Economical sustainability is then limited to the sustainability of the financial resources of the firm seeking certification.

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[124] Crawley and Aho, *Building Environmental Assessment Methods: Applications and Development Trends*, 300-308.; Haapio and Viitaniemi, *A Critical Review of Building Environmental Assessment Tools*, 469-482.; Kohler, *The Relevance of Green Building Challenge: An Observer's Perspective*, 309-320.; Cole, *Building Environmental Assessment Methods: A Measure of Success*
[125] Kohler, *The Relevance of Green Building Challenge: An Observer's Perspective*, 312.
[126] Ibid., 312.
[127] Cole, *Building Environmental Assessment Methods: Clarifying Intentions*, 238.

In the literature, we observe the proliferation of design tools, such as supplementary tools to be used as part of the assessment with a BEAT, design tools based on multi-criteria approach, and decision support kits focus on optimizing cost as well. However most of these decision support and design tools address the 'green' performances of buildings. This might be due to the ease in representing the outcome in a quantitative manner. Furthermore, it is the decisions taken early in the process that guarantee a sustainable approach, as they already fix most of the outcome of the design. Regardless of this fact, researchers inform us that designers are using these tools at the end of the design process, as was the case for the four case study projects of this study.[128]

The architectural design process "is known a top-down process, in which the original overall concept is being gradually worked towards detailed implementation."[129] BEATs assess products following a bottom-up direction, "synthesizing the overall environmental performance of a given design starting from information on and characteristics of the technical details of the system."[130] To this end, using these tools as guides is epistemologically wrong. More than 14 years ago, Crawley and Aho suggested separating the product design from its assessment, but things seem not to have changed over the years.[131]

Over the last two decades, it has become a well-known fact that designing sustainably requires the optimization of different variables by a holistic solution. The desire for such a holistic solution is seen to be decisive in the generation of the integrated design process (IDP), which has become the sine qua non of sustainability in architecture. Integrated design process includes all the parties that take role in designing, such as the design team (building owners, architects, engineers and consultants), the construction team (materials manufacturers, contractors and waste haulers), maintenance staff, and building occupants. The design team makes environmental and economic issues their guiding considerations in all decisions, and gives priority to natural systems and emerging environmental options over conventional ones. Finally, design professionals consider strategies and components as a part of a system rather than in isolation, and view the building as a series of interconnected systems, thus allowing cost savings through synergies.

It has become a well-known fact that designing sustainably requires the optimization of different variables by a holistic solution.

Even though it is suggested that IDP can lead to sustainable designs, BEATs do not reflect this kind of approach in the evaluation schemes. They do not foresee possible relationships or synergies between environmental performance criteria, and constrain networked knowing, because, as underlined by Lützkendorf and Lorenz, optimization of only one criterion is not a solution, without considering the effects of that solution for the building.[132] Then BEATs cannot be considered as an adequate guide. On this issue, Cole and Pearl state that:

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[128] Crawley and Aho, *Building Environmental Assessment Methods: Applications and Development Trends*, 300-308.
[129] Ibid., 303.
[130] Ibid., 303.
[131] Ibid., 303.
[132] Lützkendorf and Lorenz, *Using an Integrated Performance Approach in Building Assessment Tools*, 334-356.

> The way that building environmental assessment methods identifies discrete performance requirements often translates into design as a series of isolated gestures rather than encouraging “closing the loops” and responding appropriately to physical and social contexts locally. This debate is about enabling social, contextual and cultural confluences to be privileged ahead of individual actions, where the whole is far more potent and instructive.[133]

Actually if these gestures become widespread, maybe we would lose the chance to see alternative design solutions. There are only a few researches in the field that call for an integrated approach to performance assessments.[134] In line with Cole, this study argues that if the projects require an integrated process that considers the interrelationships between strategies and systems, its assessment should also reflect this attitude in the assessment schemes.

3.4.5.2 DATA QUANTITY

Even though the steps in assessment seem easy, first the collection of large number of documents, calculations, material specifications, in other words, completing the input module, and second the analysis of these inputs, lead to a very complicated system in analysis. Therefore assimilating and making sense of data, which actually require holistic and systemic thinking, becomes problematic. Furthermore Kohler states that:

> Even if this data exists, it is probably not in the necessary form or format. The only solution is to structure the project data information from the beginning in such a way that the relevant information for different views can be derived at all times from the general building data. An architect does not need the same information about a component at the design stage as an engineer working on the dimensioning of the same component.[135]

Therefore the data and the evaluations must be shared in accord with the potential users. This however requires a systematical sorting of relevant information (cost, function, energy, building process) in accord with the design process. Consequently, such a comprehensive approach is seen to give rise to a complicated system, Ding maintains that this process “may jeopardise their usefulness in providing a clear direction for making assessments cumbersome.”[136] Nevertheless people are prone to dissect the problems into diverse categories, and then this complicated system is as well addressed by dissecting design activities. The results must therefore be summarized in a simple and easily understood form so they can be assimilated within a wider context of building design and construction.

3.4.5.3 FINANCIAL ASPECTS

Assessment criteria in BEATs are seen to be broadly divided into three major categories: global, local and indoor issues. Even though manuals (especially that of LEED) explains the economic revenues of these criteria, they do not include financial aspects in the evaluation framework. This might due to the fact that they

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[133] Raymond J. Cole and Daniel Pearl, eds., *Blurring Boundaries in the Theory and Practice of Sustainable Building Design* (Glasgow: , 2007).
[134] Lützkendorf and Lorenz, *Using an Integrated Performance Approach in Building Assessment Tools*, 334-356.; Ding, *Sustainable construction—The Role of Environmental Assessment Tools*, 451-464.
[135] Kohler, *The Relevance of Green Building Challenge: An Observer's Perspective*, 313.
[136] Ding, *Sustainable construction—The Role of Environmental Assessment Tools*, 457.

are ‘green’ assessment tools, even though they assert themselves as the ultimate tool for sustainable design and construction. Ding explains this problem as follows:

> This may contradict the ultimate principle of a development, as financial return is fundamental to all projects because a project may be environmentally sound but very expensive to build. Therefore the primary aim of a development, which is to have an economic return, may not be fulfilled making the project less attractive to developers even though it may be environment friendly. Environmental issues and financial considerations should go hand in hand as parts of the evaluation framework.[137]

In reality the main reason to own a building is the intention to have financial return. So excluding financial aspects and incorporating environmental aspects neglects their interaction and it might lead developers to choose economic ones.

Another financial aspect is related with the payment made by the developer or the design office to the third party evaluator. This payment, as introduced before, amounts to $30.000 for LEED. If the certification is made international, the project in another country has to pay this amount to the U.S. In terms of economic development of a country, it might be true to argue that this is contradictory to the very definition of sustainability. The tool is not developed according to the necessities of the original country, and that country for pursuing a sustainable design has to this pay this amount to another country.[138] The study revealed through one case study project that this financial aspect is also considered with suspicion. Another financial aspect is related with the real objective underlying the use of BEATs, that is, marketing the projects. This aspect will be detailed later in the critiques on the application of tools.

3.4.5.4 COMMUNICATION OF RESULTS: OUTPUT PROFILE

Beyond a measurement tool, BEATs must reveal the consequences of design decisions in a coherent and informative way for each discipline. As mentioned above the major role of the output module is to prepare a common ground for all the stakeholders to understand the causality of performances. Then it must provide a link to cause and as well as link to action, which would offer a basis for improving deficient performances. However, the correlations of a number of criteria inside assessment module and the weightings in BREEAM seem to preclude giving relevant information according to which further decisions might be taken. Another epistemological problem lies here: “[T]he method by which the results are depicted has a direct bearing on how various performance indicators are used and understood –and by whom.”[139] Therefore the stakeholders, especially the design team, should be able to understand how various design decisions have influenced these indicators.

3.4.5.5 SCALE OF MEASUREMENT

LEED and BREEAM implicitly put forth a scale of measurement. Allocation of credits based on performance criteria and the subsequent determination of overall performance score depend on this scale. If it is a quantitative criterion, such as

[137] Ibid., 456.
[138] Even further the team has to pay a certain amount for each question to USGBC.
[139] Cole et al., *Issue Paper: Building Environmental Assessment Tools: Current and Future Roles*

thermal comfort, daylighting, or indoor quality, the tools define a minimum level (benchmark) and allocate credits based on the progress of the building with respect to this benchmark. For energy consumption credits, the progress is determined based on the improvements of the assessed building compared to a similar building, which has the same characteristics, like location, occupancy rate and satisfies the minimum local standards (BREEAM) or ASHREA standards (LEED). Current researchers inform us about incommensurability of benchmarks especially in the energy calculations and the reference standards.[140] For example, the benchmarks for carbon evaluation vary significantly between different tools. This is a problematic issue from a positivistic approach, but practically for Turkey, these tools are used concurrently, and the choice of certification tool is a very relevant issue.

Herein we observe that there are many baselines defined by each tool and these baselines reflect as well the sustainability approach of tools. From an epistemological point, such an assessment based on the improvements of buildings leaves fundamental questions unaddressed, as these tools cannot define an overall goal or objectives as end points. The limits of our knowledge of ecological and resource-carrying capacity are still largely unknown, but Cole suggested in 2005 to frame assessment tools in terms of ‘distance to sustainable,’[141] however there seems to be no indication of attempts to tighten our lifestyle to define some level of improvements.

3.4.6 COMPARISON OF BREEAM AND LEED

Although there is a considerable degree of commonality between BREEAM and LEED in terms of their aim, approach and structure, there are significant differences in terms of their scale of measurement and environmental scope. BREEAM and LEED present different ways of defining criteria for a ‘sustainable’ building. Even though they include very similar assessment categories, such as energy and pollution, materials and waste, indoor environment, the definitions explaining how the credit will be achieved, and the benchmarks indicate diverse design avenues for design professionals. To this end, the study has to make a comparison between LEED and BREEAM in terms of their relative strengths,[142] in regard to the increasing number of LEED certified or registered projects in Turkey. This comparison does not intend to argue for the convenience of one tool for Turkey; it only indicates how the choice of one specific assessment tool brings with it diverse design decisions in projects, especially when the decision to certify the project is taken after the conceptual/design phase.

3.4.6.1 BREEAM

BREEAM’s minimum standards are defined with respect to the target rating, ranging from 4 to 26 credits, whereas LEED has a fixed number of prerequisites,

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[140] Lee and Burnett, *Benchmarking Energy use Assessment of HK-BEAM, BREEAM and LEED*, 1882-1891.
[141] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 461.
[142] Martin Sleeuw, *A Comparison of BREEAM and LEED Environmental Assessment Methods*The University of East Anglia, Estates and Buildings Division,[2011]).

which does not change depending on ratings. This implies that for achieving higher ratings, buildings must comply with more minimum standards in BREEAM.

BREEAM encourages reduction in CO_2 to zero net emissions. In its 2011 version, the calculation methodology is updated, by including ratio to building's primary energy consumption, building's operational energy demand, and the total resulting CO_2 emissions. LEED allocates credits to the reductions in energy cost based on improvement over an ASHRAE 90.1-2007 baseline, without taking account of CO_2. While BREEAM adopts an incentive crediting scheme, that is, it awards higher number of credits for an increase in performance level, LEED adopts a linear scale (Fig. 3-9).[143] Lee and Burnett perform a benchmarking study amongst the earlier versions of HK-BEAM, BREEAM and LEED, and they state that it is most difficult to score credits under BREEAM.[144] Sub-metering of substantial energy uses is a compulsory minimum standard in BREEAM for Very Good, Excellent and Outstanding ratings. LEED has no energy sub-metering prerequisite.

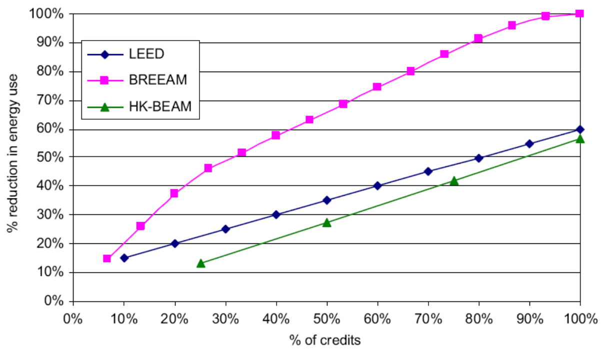

Fig. 3-7: Credit scale of the three schemes: BREEAM, LEED, and HK-BEAM prepared by Lee and Burnett.[145]

LEED does not include credits for life-cycle costing; it only suggests performing. Therefore it may not help to balance environmental and economic poles, as it does not encourage the most environmentally efficient allocation of capital.[146] BREEAM provides details about materials and their life-cycle impacts, which are assembled in the Green Book Live and the Green Guide to Specification. However to achieve corresponding credits in LEED, teams must search for suitable materials from a multiplicity of manufacturers' and/or third parties' product evaluations/certifications or relatively simplified checklists.[147]

In terms of actual accessibility of public transport, BREEAM's travel plan credit is seen to be well detailed compared to LEED, which does not take into account the routes, hours of service and frequency of service. Even further, BREEAM credit "includes a requirement to actively encourage alternative options to car or other high environmental impact forms of transport."[148]

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143 Lee and Burnett, *Benchmarking Energy use Assessment of HK-BEAM, BREEAM and LEED*, 1886.
144 Ibid., 1890.
145 Ibid., 1886.
146 U.S. Green Building Council (USGBC), "The Green Building Information Gateway," U.S. Green Building Council (USGBC), http://www.gbig.org/ (accessed February, 20, 2013).
147 Sleeuw, *A Comparison of BREEAM and LEED Environmental Assessment Methods*
148 Ibid.

3.4.6.2 LEED

In terms transparency, LEED's approach is explained to be "more consensus-based and transparent compared to BREEAM's."[149] Even though the technical criteria proposed by the various LEED committees are publicly reviewed for approval by USGBC's member companies and organizations, it is criticized for being influenced by manufactures, contractors, and developments, instead of following scientific research.[150] Reaching LEED resources, researches or case studies is seen to be relatively easier than in the case of BREEAM. For example The Green Building Information Gateway publishes case studies, accompanied with achieved credits per building, country specific details.[151] However BREEAM does not share either the number of buildings or details about achieved ratings.

Performing POE is a compulsory criterion in LEED, according to which all certified buildings must commit to sharing their actual energy and water usage data at least for five years, even if there is a change in ownership or occupation. Furthermore, LEED assigns one credit for projects which commit to "develop and implement an energy consumption measurement and verification plan as well as a corrective action process for a minimum of one year post-occupancy."[152] For BREEAM conducting a POE is an optional criterion.

Reducing the heat island effect, through green roofs, shading by trees, or using high solar reflectance materials, is a separate criteria in LEED. BREEAM also offers credits for green roofs; however "it is for the purposes of mitigating ecological impact and reducing surface water run-off."[153] It might not be a coincidence to see green roofs as sine qua non of LEED certified projects in Turkey.

3.5 PROCESS OVER PRODUCT

Previous researches on BEATs have especially dealt with the 'product' aspect of BEATs, that is, their technical features. Their use as design guidelines brings forth the investigations of the design processes with these tools as an important research track.[154] In regard to the critics on the structuring of criteria, which might allude a wrong perspective to design professionals, along with the important, however neglected, role of output module in communicating the 'story' of the performance evaluation, the 'process' aspect deserves much attention,[155] to "improve the quality and effectiveness of the social and technical processes that produce buildings."[156]

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[149] Ibid.
[150] Ibid.
[151] U.S. Green Building Council (USGBC), *The Green Building Information Gateway*
[152] Sleeuw, *A Comparison of BREEAM and LEED Environmental Assessment Methods*
[153] Ibid.
[154] Zukowski, *From Green to Platinum: LEED in Professional Practice*; Hasan Haroğlu, "The Impact of Breeam on the Design of Buildings," *Proceedings of the ICE - Engineering Sustainability* (2012).
[155] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 436-449.; Cole, *Transitioning from Green to Regenerative Design*, 39-53.; Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 455-467.
[156] Kaatz et al., *Advancing Key Outcomes of Sustainability Building Assessment*, 309.

BEATs should emphasize process-related issues to generate an informed decision-making process and focus on "transforming 'the culture of the construction industry to accommodate sustainability as a common, consistent and integral part of its decision-making."[157] Yet, there is still no definite way to best address sustainability issues in the construction sector and again what might be the role of BEATs in enhancing it.[158]

Kaatz *et al.* state that "in the short-term, the most significant aspect of building sustainability assessment is the integration of issues, different ways of knowing, different perspectives, values and objectives in decision-making."[159] The core of any attempts to improve this aspect is dependent upon the improvements in judgment.[160] Kaatz *et al.* state that "[i]n order to address and attain its numerous objectives, building assessment should be viewed as a process dynamically integrated with the building project cycle rather than a single activity."[161] In fact, as indicated above, the presentation of these objectives should be in a simple, robust, but also a much as possible a comprehensive manner. This requirement calls for an integrated design and construction process, and the collaboration among professionals. The role of BEATs might be the incorporation of timely conversations, and dissemination of information that are coupled with quantitative analysis based on a shared vision of all stakeholders, thus an agreed course of action.[162] We should keep in mind that knowledge held by each practitioner has a variety of forms, which may thus be transferred through methods which are appropriate for the context and stakeholders involved.[163] The project life cycle should be planned in advanced by putting ahead the points of contact among practitioners. Moreover, this shared vision should involve both professional and lay stakeholders.[164] This type of collaboration and planned project life cycle would therefore enable "the participants [to] learn through experience and feedback, which are facilitated through phase reviews."[165] The integration of different types of both knowledge and experiences through the participation of all the stakeholders, along with integration of the assessment outputs into the process, enables the generation and transfer of explicit and tacit knowledge.

BEATs give information about "component" knowledge, but not concept knowledge.[166] While component knowledge refers to analysis on energy, daylighting analysis or water consumptions, concept knowledge entails the ability to foresee the relationships and interactions among different component knowledge. Enhancing the concept knowledge is therefore a prerequisite for sustainability in design. There are however two types of knowing for practitioners:

[157] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 464.
[158] Kaatz et al., *Advancing Key Outcomes of Sustainability Building Assessment*, 311.
[159] Ibid., 312.
[160] Ibid., 312.
[161] Ibid., 312.
[162] Ibid., 313.
[163] C. S. Thomson, M. A. El-Haram and R. Emmanuel, "Mapping Knowledge during Sustainability Assessment within a PPP School Project" (Nottingham, UK, Association of Researchers in Construction Management, 7-9 September, 2009).
[164] B. Fowles, "Transformative Architecture: A Synthesis of Ecological and Participatory Design," in *Ethics and the Built Environment, Professional Ethics*, ed. W. Fox, 2000), 102-114.
[165] Kaatz et al., *Advancing Key Outcomes of Sustainability Building Assessment*, 314.
[166] Heylighen and Neuckermans, *Design(Ing) Knowledge in Architecture*

Passive learning, constructive mode of knowing, gained through making, thus designing.[167]

The call for assessment tools to become an educational and empowering medium is seen to be an important issue for this study. To understand the role of BEATs in changing these processes, thus innovating or generating new practices is actually at the core of this study. In line with this objective, the study uses SPT to foresee how a new structure like LEED or BREEAM interacts with an everyday practice of architect, that is, designing. The study therefore uses this theory not only in explaining how new sustainable lifestyle patterns might be generated, but also how new sustainable designing practices for architects might be generated with the help of BEATs in terms of triggering constructive learning.

3.6 MARKET TRANSFORMATION

Another crucial objective of this study is to question whether the widespread adoption of BEATs would ultimately lead to market transformations, in terms of rising demands for buildings with higher environmental performance. As these tools are voluntary in their application, they might trigger companies in the sector seeking to gain market advantage. Even further, they might motivate innovation, and encourage material and product suppliers in developing “new environmentally beneficial products, services and practice and to bring down the costs of these new technologies as they reach economic production scales.”[168] Even though in Turkey the number of certified/in certification process buildings is very low compared to the number of new buildings built in a year, the interest of the building sector in these tools might be considered an important indication for transforming the sector. Also in 2013, a new environmental assessment tool for homes will be announced by the Ministry of Public Works. This indicates that practice with BREEAM or LEED is still a niche-activity, compared with the overall construction regime in Turkey. There are two key questions on this issue that this study aims to delve in the following chapters:

1. Does the market appreciate the sustainability definition of these tools and their value of high performances?
2. Do the problems delineated in this chapter, in terms of scale, time and criteria, interest the architects and then the market in relinquishing the use of BEATs?
3. Is it possible for assessment tools to transform the market in the most effective manner? What might be the barriers in their applicability?

There are two reasons for focusing on the market transformation: As explained in detail in Chapter 2, the mechanistic worldview is the major cause of current environmental problems, and based on the above given critical review, it seems that these assessment tools are also developed based on this outdated lens. If their sustainability definition, along with their approach to design sustainable building spread over the sector, it would not make sense. From another perspective, these tools, especially for Turkey, are probably the primary vehicle for

[167] Ibid.
[168] Cole et al., *Issue Paper: Building Environmental Assessment Tools: Current and Future Roles*

conveying the concept of sustainability. An important research track would be to reveal how the sector responds to these novelties, either by resisting or by adapting itself. Delineating the response from the Turkish sector, in terms of adaptation or shifting track, would be informative for the preparation of next generation assessment tools. For this purpose, the study interprets the current situation in the field based on the multi-level perspective (MLP) explained in Chapter 4.

3.7 SUSTAINABLE, BUT HOW?

Starting with major characteristics, along with the early success of BEATs, the chapter made a review of the state-of-the art. Then the answers to the questions given at the beginning of this section are as follows:

- How do BEATs see the world?

  The world is formed out of complex interdependent problems. These problems can be divided into its parts, into criteria. And there are hierarchies among these parts. The whole is formed out of its parts.
- How do BEATs know the world?

  If we know the sum of its parts, we can know the whole based on weightings, in term of their relevance to environmental impacts.
- How do BEATs address the world through assessment?

  If the project complies with a number of assessment criteria, it would become sustainable.

In this chapter, the characteristics of BREEAM and LEED are laid down and then evaluated with reference to their 'seeing, knowing, and doing' domains. The study aimed to demonstrate how the current mechanistic worldview has an essential role in the part/whole division, thus in the division of criteria in the input module. Instead of enhancing interactions between the criteria in the assessment, this aspect is also criticized for possible point-chasing attempts by professionals. This study suggests that if the credit system will be followed by next generation assessment tools, a new input module should prepare a table of criteria interactions by using a systemic approach, and the assignment of credits should be based on this table. In the light of the suggested whole/living systems worldview, the study accounted the importance of the flexibility of both the criteria and their interaction within the input module to enhance the assessment module.

This chapter discloses the following possibility: If designers use these assessment tools in lieu of design guideline, they would probably design technological fixes, if they do not redefine the role of 'inhabitants,' blur the boundaries among stakeholders, and think about designing for a particular place. The shift that would trigger sustainability transition, as explained in Chapter 2, seems to lie in changing our ways of seeing the world and designing in line with it. Till now, the study criticized these tools from a theoretical point of view, and drew major conclusions based on academic literature review. It is true that there are good practices among these certified buildings, and that these buildings, as niche-activities, contribute significantly to the market and the building industry. Thus the study will now change track and pursue a practice-based approach to determine how these tools guide real design processes. Academic researchers are essential in explaining and searching for an ideal process; however what real practitioners see, know and do are important for the appreciation of these tools. To accomplish this objective, the study explained the role of social practice theory for understanding ‘new’ practices in designing and it suggested pursuing a multi-level perspective framework for understanding how these niche-activities are interacting with the overarching construction regime.

CHAPTER

4 THEORETICAL FRAMEWORK: INNOVATIONS IN SOCIO-TECHNICAL SYSTEMS

This study intends to investigate the possible role of BEATs in fostering innovations not only at the level of practices of design professionals, along with occupants or users, but also in socio-technical system of built environment to attain sustainability. In this sense, by conceiving buildings as socio-technical artifacts, this chapter aims at delineating the theoretical framework based on which the case study projects will be analyzed. In regard to the co-evolution of design and the other practices effective on the socio-technical system, the objectives of the study require a two-level approach. While the first level, as practice level, will be delineated through social practice theory (SPT), the second level will be examined through to Multi-Level Perspective (MLP). This chapter introduces and furthers these two theories for the current study.

This chapter starts with a position articulated by David Chipperfield, the curator of 13th International Architecture Exhibition at La Biennale di Venezia 'Common Ground', that we, as architects, are rapidly losing the interdependence between architectural practices and society. This may be a consequence of the path that we're heading down over the last century. Chipperfield makes the following statement:

… [T]he common ground that we must determine is that between the profession and the society it wishes to represent. Architecture requires collaboration, most importantly it is susceptible to the quality of this collaboration. […] It involves commercial forces and social vision; it must deal with the wishes of institutions and the needs and desires of individuals. Whether we articulate it or not, every major construction is an amazing testament to our ability to join forces and make something on behalf of others. The fact this effort is so often regarded as negative rather than impressive, only confirms the dysfunctional nature of this process and the difficulty of coordinating commercial forces and public will. Good architecture doesn't happen naturally, it requires conspiracy of circumstances and participants. While architecture can provide ideas and visions, the relevance of these ideas depends on a meaningful engagement with the society they presume to serve.

[…] [Architects] are both antagonists and service providers. Architects can only operate through mechanisms that commission them and which regulate their efforts. Their ideas are dependent on and validated by the reaction of the society it desires to represent. This relationship is not only practical but concerns the very meaning of the architect's work. In the increasingly complex confrontation between commercial motivations of development and the persistent desire for a considered and comfortable environmental, there seems to be little meaningful dialogue. If we intent good architecture to be not for the privileged and exceptional moments of our built world, we must find a more engaged collaboration between the vision of architects and the expectations of society.

[…] While today our relationship to the ground is no longer as profound as in centuries past, it remains critical to our understanding of our place in the world and where we stand.[1]

This position holds that architecture and society must co-evolve. We share a common ground. This ground has been totally altered over the course of the last 150 years and now urgently calls for turning back to the basic practical considerations of architecture, that is, relinquishing personal fulfillments for the sake of the realization of a common ground. Based on this position, this chapter explains the theoretical background of this study, which enables the investigation of the interdependence between the built environment and the society, by contending that architectural artifacts are socio-technical.

The ongoing discussion in this study identified that for aligning the built environment and lifestyles to a sustainable path, in line with researches in the field, it is necessary to change the mechanistic worldview, and thus the current paradigm within which current building practices are performed. The regenerative paradigm framed by whole/living systems is suggested as a key for sustainability in architecture. By consequence, this vision requires "innovation at a systemic level" that substantially alters "the way things are done and how societal needs are created and met."[2] The field asks for "a radical transformation of the way buildings and infrastructure are managed across their life cycle to address enhanced social aspirations as well as the challenges of changing climate, demographic growth, financial constraints and aging infrastructure."[3] Then changing the worldview espoused only by design professionals is not an adequate step towards sustainability, if we consider Chipperfield's remark again: "Architects can only operate through mechanisms that commission them and which regulate their efforts. Their ideas are dependent on and validated by the reaction of the society it desires to represent."[4]

"Architects can only operate through mechanisms that commission them and which regulate their efforts. Their ideas are dependent on and validated by the reaction of the society it desires to represent" (Chipperfield, 2012, 13)

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[1] David Chipperfield, "Introduction," in *Common Ground: A Critical Reader*, eds. David Chipperfield, Kieran Long and Shumi BoseMarsilio, 2012), 13-14.
[2] Tom Hargreaves, Noel Longhurst and Gill Seyfang, "Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory" (3S Working Paper 2012-13, Norwich: Science, Society and Sustainability Research Group, 2012).
[3] Whyte and Sexton, *Motivations for Innovation in the Built Environment: New Directions for Research*, 473.
[4] Chipperfield, *Introduction*, 13-14.

This study conceives buildings as socio-technical artifacts, "where material structures are interwoven with the uses of the buildings."[5] This approach is explained by Guy and Moore as follows:

> Our approach is then to analyze sustainable buildings as sociotechnical artifacts constructed and reconstructed in situationally specific contexts. Our use of the term ''technology'' here is an expansive one. We mean by it not only the artifacts associated with sustainable architecture—solar collectors, wind generators, biomass boilers, and the like—but also the knowledge required to construct and use these artifacts, as well as the cultural practices that engage them.[6]

The inclusion of the social aspects into analysis is crucial, because these technological artifacts are inserted into particular environments, in which traditions regarding for example property rights or public services are diverse. If the objective is to design buildings that alleviate environmental problems, then designers have to think about the broader social climate in which their solutions will be implemented.[7] To better explain the situation, the study refers to an example:

> Environmental degradation, most analysts now recognize, is as much a social problem as it is a technological one. The heating and cooling of urban buildings, which is linked to the "urban heat island effect," and rates of fossil fuel consumption, are just two considerations. In the United States almost every building has its own heating and air-conditioning system. In contrast, many European cities have municipally owned "district" heating and cooling systems that significantly reduce emissions and improve fuel efficiency.[8]

This inclusion is therefore in line with the regenerative paradigm that calls designers to focus on the peculiarities of 'place.'

This challenge lies beyond the level of architectural practice, it requires fundamental changes in 'deep structures,' that is the systems of provision and infrastructures, including but not limited to processes of planning, designing, and envisions about living in cities and in buildings, transportation, policy, energy supply system, and culture. Then incremental improvements in systems of provision and infrastructures that remain in the mechanistic paradigm would represent a partial solution to the problem. With respect to the field of architecture, the challenge lies in enabling radical innovations in design processes that deviate from the existing paradigm, framed by mechanistic worldview, and that touches upon the rules of the socio-technical regimes. Making innovations in the industry of building is not an easy task. This is partly due to the characteristics of the field, which will be explained later in the following chapter, and partly due to the above-mentioned deep structures of the socio-technical system sustaining the current practices. Then, how is it possible to conceive innovations, or rather radical innovations in architectural practices, for altering the overall configuration of socio-technical system of the built environment?

This challenge lies beyond the level of architectural practice, it requires fundamental changes in 'deep structures,' that is the systems of provision and infrastructures.

[5] Jesper Ole Jensen et al., "Has Social Sustainability Left the Building? the Recent Conceptualization of "sustainability" in Danish Buildings," *Sustainability: Science, Practice & Policy* 8, no. 1 (2012), 96.
[6] Guy and Moore, *Sustainable Architecture and the Pluralist Imagination*, 18.
[7] Peter Kroes et al., "Design in Engineering and Architecture Towards an Integrated Philosophical Understanding," in *Philosophy and Design: From Engineering to Architecture*, eds. Pieter E. Vermaas and others Springer, 2008), 9-10.
[8] Ibid., 9.

This study examined the contested nature of the sustainability and underlined that there might not be a single route or design guideline for pursuing sustainable design in the built environment. However, arguments stemming from *eco-technic* logic, which is framed by the mechanistic worldview, are seen to be at the upfront of researches looking for a consensus on universal best environmental practices. This approach precludes any attempts to include the exigencies of local contexts, by consequence social aspects of sustainability.

As an example of eco-technic logic, BEATs are examined with respect to the necessities of the new regenerative paradigm. By envisioning a particular definition of sustainability, BEATs seem to follow a very limited approach to deal with environmental degradation. They define boundaries among the scales of sustainability: Time, building/region, context, and criteria. The decomposition of the performance criteria is explained to foster again a mechanistic approach, which splits the parts defining the whole. These limitations put onto design decisions might foster the same type of technological fixes, instead of reexamining possible new design approaches relevant to local contexts. Regardless of these problems stemming from the use of BEATs, if the future direction and success of sustainable buildings, especially in Turkey, relies on the abilities of these tools, then a scrutiny on the practices with these tools and the interaction of these practices with overarching structures, or regimes like energy, transportation, materials, is vital. This scrutiny might reveal possible innovation patterns triggered by BEATs that might enable the transition towards sustainable communities and sustainable built environments.

The first main objective of this study is to examine how and in which ways BEATs enable innovations in design practices, in fact not only in the product, but also, and essentially, in design processes. This objective requires an analytic method “which can explore variations in the form, meaning and use of formally identical artefacts”[9] like BREEAM or LEED. Understanding how particular artifacts and practices come to take on one form rather than another is essential for this study, because if these practices, regardless of the context, focus on one particular interpretation of, for example, LEED, this might lead to similar design solutions, which would limit attaining multiplicity in making green knowledge. The second major objective of this study is to reveal whether these tools might enable major deep-structural changes in the overall socio-technical system.

With respect to the multi-dimensionality in the interested parties within the production of built environment, the study foresees benefit in pursuing heuristic frameworks developed in this nascent field of sustainability innovation studies, which examines these systemic changes, as called ‘socio-technical transitions.’ Regarding the motivations for innovation in the built environment, researchers in the field have recently started to discuss the benefits of applying these innovation theories mainly developed in “established research traditions on the economics

[9] Libby Schweber and Chris Harty, "Actors and Objects: A socio-technical Networks Approach to Technology Uptake in the Construction Sector," *Construction Management and Economics* 28, no. 6 (2010), 673.

and management of innovation that come into contact with work on innovation from sociological and political perspectives."[10] For examining the interaction between the practices guided by BEATs and the socio-technical system of built environment, the study refers to a middle-range theory developed in this research track, called Multi-Level Perspective (MLP). This theory is mainly developed by Rip and Kemp,[11] and subsequently applied most prominently by Smith and Geels.[12] There are just a few researches which applied this heuristic tool in explaining green innovation,[13] and to the best knowledge of this author, there is currently no research which applied it for the analysis of BEATs.

Multi-Level Perspective (MLP) sees innovation and transitions as a result of the tensions between three vertical levels: Niche, regime (practice), and landscape. The theory defines niche as the locus of radical innovations, regimes are the practices embedded in institutions and infrastructures. Landscape refers to climate and geographical zones, which cannot be altered easily within a short time span by human agency. There are diverse possible transition patterns defined by the theory and the study will detail these aspects in the following sections. The study accepts the practices with BEATs as a niche activity, considering the number of new constructed buildings against the certified buildings in Turkey.

There is a growing literature that undertakes research on architectural design processes through the use of social practice theory (SPT).[14] Even though the two theories, MLP and SPT, "differ fundamentally in how they understand the processes through which such sustainability innovation does occur (or does not) come about,"[15] Geels states that SPT, and actually human agency, and practices are part of the MLP as well. While the niche level denotes practices that deviate from the rules governing regime practice, the regime level refers to routine practices within a particular field. However, SPT sees innovation in practices as a result of the integration and then horizontal circulation of different elements to practices.[16] Regarding the new elements, in terms of new requirements, brought by BEATs into projects, we might observe that practices with BEATs would represent deviances from normal or routine architectural practices, in other words from organizational and design routines.

This chapter will develop two heuristic models: One based on SPT to analyze how BEATs alter routine practices; and the second based on the combination of these

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[10] Whyte and Sexton, *Motivations for Innovation in the Built Environment: New Directions for Research*, 474.
[11] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 25.
[12] Geels, *From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory*, 897-920.; Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 24-40.; Smith, *Translating Sustainabilities between Green Niches and Socio-Technical Regimes*, 427-450.
[13] Ibid.Jensen et al., *Has Social Sustainability Left the Building? the Recent Conceptualization of "sustainability" in Danish Buildings*, 94-105.
[14] Zukowski, *From Green to Platinum: LEED in Professional Practice* In her thesis, Zukowski carried out a research on architectural projects certified with LEED, and analysis case studies based on Giddens' social practice theory.
[15] Hargreaves, Longhurst and Seyfang, *Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory*, 4.
[16] Ibid.

two theoretical approaches to analyze how practices with BEATs competes with the well established regimes, such as transportations, energy, material production and socio-cultural. There is currently only one research which integrates these two theories for explaining sustainability transitions in two fields, organic food and transportations regimes.[17]

To structure the whole discussion, the chapter first starts with explaining different types of innovations. In order to indicate the theories guiding the study, the study first details the major characteristics of socio-technical systems and the rules governing the formation of socio-technical regimes. Then it introduces the analytical framework developed by MLP, which indicates avenues for regime transitions, along with the explanation of niche and regime activities. The study then explains the analytical framework developed by researches on SPT, along with theories on design thinking, so as to explain design practices and designs in practices. The chapter finishes with the theoretical model developed to analyze case studies.

4.1 INNOVATIONS

In a nutshell, "innovation refers to the change in the way something is done."[18] An innovation might occur not only in the product (product innovation), but also in the process of doing things (process innovation). The study thus differentiates between product innovation and process innovation for the practice with BEATs. Revealing the influence of BEATs on changing the traditional practice means innovations in practices, and the innovation is considered from the perspectives of architects.

4.1.1 TYPES OF INNOVATIONS

While the literature calls revolutionary innovations conceived in a new paradigm as 'radical' innovations, those remaining within the limits of an existing paradigm are referred as incremental.

Innovations are explained to vary along a continuum from incremental to radical. As the study sees radical innovations as a key for sustainability transitions in socio-technical systems, certain criteria that demarcate level of innovations are required. While the literature calls revolutionary innovations conceived in a new paradigm as 'radical' innovations, those remaining within the limits of an existing paradigm are referred as incremental.[19] Dahlin and Behrens maintain that a radical innovation should fulfill two characteristics: "[I]t should be dissimilar from prior and current innovations and it should influence future innovations."[20] Carrillo-Hermosilla *et al.* defines radical changes as "competence-destroying, discontinuous changes that seek the replacement of existing components –or entire systems– and the creation of new networks, creating value added."[21] These types of innovations might cause pervasive changes in technologies or in our case design processes that might lead

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[17] Ibid.
[18] Javier Carrillo-Hermosilla, Pablo del Río and Totti Könnölä, "Diversity of Eco-Innovations: Reflections from Selected Case Studies," *Journal of Cleaner Production* 18, no. 10-11 (2010), 1075.
[19] Milou Beerepoot and Niels Beerepoot, "Government Regulation as an Impetus for Innovation: Evidence from Energy Performance Regulation in the Dutch Residential Building Sector," *Energy Policy* 35, no. 10 (2007), 4814.
[20] Dahlin and Behrens cited in Ibid., 4814.
[21] Carrillo-Hermosilla, del Río and Könnölä, *Diversity of Eco-Innovations: Reflections from Selected Case Studies*, 1075.

to institutional and social changes, or create a paradigm shift in the field. The literature review on innovations reveals various terms to define the level of innovativeness for radical innovations.[22] In line with socio-technical approach to innovation that will be introduced later, the study draws on an evolutionary perspective of innovation, "according to which innovation arises through a systemic process that refers to the interconnectedness and dynamic interaction between different actors and internal and external factors influencing the innovation process."[23]

In fact very few innovations represent such substantial and disruptive effects. The majority of innovations are aligned within the existing paradigm; as a consequence, they produce only incremental improvements in products or in processes. The incremental changes refer to "gradual and continuous competence-enhancing modifications that preserve existing production systems and sustain the existing networks, creating added value added in the existing system in which innovations are rooted."[24] As will be explained later, based on the MLP, incremental changes follow the path defined by the socio-technical regimes. Beerepoot includes another level in-between these two levels as well, and maintains that there are certain innovations, which are neither radical nor incremental, "but may be new in their application within a certain sector, and therefore can be considered as 'really new."[25]

There are certain innovations, which are neither radical nor incremental, "but may be new in their application within a certain sector, and therefore can be considered as 'really new" (Beereport, 2007, 4814)

With respect to the regime practices within the Turkish building industry, the study considers all practices with BEATs as innovations, in regard to their use of new technologies, new materials, and integrated design process. In fact the influence of BEATs on the design decisions and on the uptake or invent new technologies is crucial as they might trigger changes in paradigm. To define the level of innovation that is involved in the case study projects, the study again uses the methodology on the interaction between seeing, knowing and doing domains. The study compares the domains of niche practice of each case study project to the domains pertaining to the regime level, so as to determine whether the niche causes a disruptive change in the process or in the product. In terms of the worldview, the study focuses on the seeing domain of niche practice to determine whether it is aligned with the regenerative paradigm. That means the study defines innovativeness of each practice in two levels, first level of innovation with respect to the regime practices, and second, level of innovation with respect to the new paradigm.

The study defines innovativeness of each practice in two levels, first radical with respect to the regime practices, second with respect to the new paradigm.

[22] Freeman and Perez (1988) distinguish between incremental, radical innovations, changes of technology system and changes in techno economic paradigm. Christensen (1997) defines two levels as sustaining and disrupting innovations. Tukker and Butter (2007) define system optimization, singular innovation and system-level innovations.
[23] Ibid., 1075.
[24] Ibid., 1075.
[25] Beerepoot and Beerepoot, *Government Regulation as an Impetus for Innovation: Evidence from Energy Performance Regulation in the Dutch Residential Building Sector*, 4814.

4.1.2 BOUNDED VS. UNBOUNDED MODES OF INNOVATION

Beyond the intentions of the implementer, the context into which an innovation is introduced might affect the distribution and the (potentially unforeseen) uses of a particular innovation as well, and this might not be due to the inherent characteristics of an innovation or its implementation strategy per se. An innovation might have an influence on a single sphere. However, in regard to the inter-organization contexts of design and construction practices, which rely on the distribution of power across multiple organizations within construction projects, an innovation might also influence the wider inter-organization landscape of design and construction processes.[26] Harty terms these as 'bounded' and 'unbounded' modes of innovation.[27] This distinction is highly relevant for the present study. So, successful environmental innovations are expected to have an unbounded mode of implementation. BEATs would become a potential driver of innovation, if its implementation crosses the boundaries of all the stakeholders of the project. Besides it should as well influence major structures, such as spatial planning, energy distribution, material developers. Successful implementation of BEATs would require new practices that weave the whole design and construction process. This is one of the main reasons why the previous chapter underlined the importance of introducing all the stakeholders into the process and aligning their visions to facilitate their interactions.[28]

Then successful environmental innovations shall have an unbounded mode of implementation.

4.2 BROADENING IN PROBLEM FRAMING AND ANALYTICAL PERSPECTIVE

The quest for altering the configuration of the built environment "imply a different kind of innovative activity to that traditionally associated with a single product or new business practice."[29] This ambition requires the broadening of the problem framing to "a perspective on systems innovation"[30] due to two reasons. First, as mentioned above, environmental problems require altering how things are done:

The quest for altering the configuration of the built environment "imply a different kind of innovative activity to that traditionally associated with a single product or new business practice" (Smith, 2007, 428).

> Ecological restructuring of production and consumption patterns will require not so much a substitution of old technologies by new ones, but radical shifts in technological systems or technological regimes including a change in consumption patterns, user preferences, regulations, and artefacts.[31]

Second, as maintained by Geels, transitions towards sustainability have special characteristics compared to a number of historical transitions.[32] Herein transition means that a major change has occurred in the system, and that societal functions (housing, energy, water, etc) are fulfilled. First, sustainability transitions are goal-oriented or 'purposive' as they intend to resolve the environmental problems. In

Sustainability transitions are goal-oriented or 'purposive,' and "[s]ustainable solutions do not offer obvious user benefits" (Geels, 2011, 25).

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[26] For example elevator is an unbounded innovation, it enabled the construction of tall buildings. Internet is as well an important unbounded innovation.
[27] Chris Harty, "Innovation in Construction: A Sociology of Technology Approach," *Building Research and Information* 33, no. 6 (2005), 515.
[28] Ibid.
[29] Smith, *Translating Sustainabilities between Green Niches and Socio-Technical Regimes*, 428.
[30] Adrian Smith, Jan-Peter Voß and John Grin, "Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and its Challenges," *Research Policy* 39, no. 4 (2010), 439.
[31] Hoogma cited in Smith, *Translating Sustainabilities between Green Niches and Socio-Technical Regimes*, 428.
[32] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 25.

contrast, historical transitions in Geels' word were 'emergent,' for example, a company looking for gaining opportunities while releasing new technologies. Second, "[s]ustainable solutions do not offer obvious user benefits (because sustainability is a collective good), and often score lower on price/performance dimensions than established technologies."[33] Then without alterations in the economic pole, in the form of taxes, subsidies, regulatory frameworks, and expectations, it might not be possible for innovations to replace existing regime practices.

Just an example from an overview article on social housing, which specifies the following four-pronged approach, reveals why the supply chains are crucial for this transition:

> 1. What is needed to make the market deliver Nearly Zero-Energy Buildings which are easier and cheaper to build and manage?
> Housing providers must ensure that the market delivers nearly-zero energy homes which are both simpler and cheaper to build and manage. We know it can be done, but more **pressure on market actors** is needed so that it is done at affordable prices.
> 2. What is required to reach the renovation rates necessary to meet targets?
> The key to a successful refurbishment work, after all, is a well-thought through **financing scheme** […] Improving **collaboration along the building chain** has also been identified as a must to enabling delivery, bringing down costs of both renovation works and maintenance.
> 3. What is needed to boost decentralised energy production and ownership?
> After reducing energy demand, if buildings are truly to become 'nearly zero', they must become an **integrated component of the energy producing infrastructure** […]A thorough revision of tax laws, energy regulation and a framework of long-term incentives is needed to make this common practice.
> 4. What is needed to bring initiatives together? Community outreach and trust
> 52 million people cannot afford to heat their homes in the EU. Unless **policy makers** make serious efforts to address this issue like in the United Kingdom, trust will not be forthcoming. Energy efficiency and renewable energy must be made accessible for all - not only for those who can afford it.[34]

4.2.1 SOCIO-TECHNICAL SYSTEMS

In line with the ecological worldview, the regenerative paradigm has brought forth the importance of networks, thus a systemic approach to sustainability. Then we are facing a duality. Rendering buildings sustainability cannot enable on their own the establishment of sustainable built environments, vice versa the number sustainable buildings and neighborhoods cannot be attained without aligning the socio-technical system that supports and generates them. What do we mean by socio-technical system? Brown and Vergragt explain socio-technical system (ST-system) as follows:

> [It] denotes a relatively stable configuration of techniques and artifacts – as well as institutions, rules, practices and networks – that determine the 'normal' developments and use of technologies in a particular area of human needs. Socio-technical systems fulfill socially valued functions that they, in turn, constitute. They also embody strongly held convictions and interests concerning particular technological practices and lifestyles, existing

[33] Ibid., 25.
[34] Edwards, Sorcha (CECODHAS Housing Europe), "OVERVIEW - Social Housing Providers Reach for 20-20-20 Targets - and Beyond."

> institutions, and the best ways in which these may be improved. Stability and resilience are central to socio-technical systems. That means that change is slow, involving both innovations in science and technology and changes in institutions, professional norms and practices, lifestyles, belief systems, and others.[35]

In looking for “the guiding principles, industrial structure, user relations, policy, knowledge and social meanings”[36] active both in the formation of technology and its use in specific contexts, therefore again “the situated knowledge,” is essential for meeting the sustainable challenges that call for system innovations. By delineating a broader focus for innovation studies, “system innovation refers to the renewal of a whole set of the networked supply chains, patterns of use and consumption, infrastructures, regulations, etc., that constitute the *socio-technical systems* which provide basic services such as energy, food, mobility or housing (emphasis added).”[37]

This approach transcends boundaries among independently conceived products, buildings, processes or technologies. By consequence, it renders difficult the evaluation of sustainability of isolated technologies, “if not analysed as embedded in a system context.”[38] Smith *et al.* claim that this approach acknowledges that elements within socio-technical systems have various interdependencies among each other; thus they obstruct diffusion of new or alternative socio-technical provision, such as public transport, renewable energy, or ecological building.[39] Therefore they might impede the diffusion of environmental sensitive innovations.

For such a system innovation that would guide us towards a sustainable future, in line with Cole and du Plessis, the present study has propounded changing the worldview. While shifting the focus from parts to whole, focusing on system innovations seems very much in line with the research paradigm based on whole/living worldview. In the literature, these systemic changes are often called ‘socio-technical transitions,’ as they involve alterations in the overall configuration of systems and are complex and long-term processes.[40] The elements of systems are shaped and transformed by multiple actors such as firms, politicians, researchers, architects, civil society, and engineers. This focus poses a challenge for researches dealing with more specific environmental innovations. This is probably in the case of designing with BEATs, too. Currently we observe that there are new assessment tools for evaluating neighborhoods, but this again remains at a micro-level compared to the multi-faceted nature of systems. Actually the above-mentioned types of innovations are defined for assessing innovation in the building scale but it is introduced for methodological purposes, because it is crucial for this

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[35] Halina Szejnwald Brown and Philip J. Vergragt, "Bounded Socio-Technical Experiments as Agents of Systemic Change: The Case of a Zero-Energy Residential Building," *Technological Forecasting & Social Change* 75, no. 1 (2008), 108-109.
[36] Adrian Smith, "Governance Lessons from Green Niches: The Case of Eco-Housing," in *Governing Technology for Sustainability*, ed. Joseph Murphy (London, Sterling, VA: Earthscan, 2007), 91.
[37] Smith, Voß and Grin, *Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and its Challenges*, 436.
[38] Ibid., 439.
[39] Ibid., 439.
[40] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 24.

study to reveal how much the product or processes deviates from the overarching regime.

Innovation studies focus mainly on the production side from which innovations emerge, and do not include the user side perspective explicitly in the analysis. ST-systems consider the user side by incorporating production, diffusion and use of technology.[41] ST-systems are defined by Geels as “the linkages between elements necessary to fulfill societal functions (e.g. transport, communication, nutrition).”[42] To fulfill these functions, Geels differentiates between production, diffusion, and use as sub-functions, which are referred to as resources. ST-systems are conceived as the outcome of the activities of human actors. These actors belong to diverse social groups, based on their certain shared characteristics (certain rules, norms, practices). In modern societies, these social groups are related with resources and sub-functions in ST-systems.[43]

The social groups have relative autonomy. They share, we might say, a particular discourse and have interactions among each other. They form “networks with mutual dependencies.”[44] Owing to these interdependencies, without losing their identity, these social groups are aligned to each other. Geels underlines that “[t]he relationship between sub-functions and resources on the one hand and social groups on the other hand is inherently dynamic.”[45] Over the course of the last century, dynamic specialization and differentiation are explained to result in the proliferations of distributed social groups. It is more difficult than ever to differentiate the boundaries of groups, as relationships among them shift over time. Geels states that “human actors are not entirely free to act as they want.”[46] These groups are influenced and coordinated by certain rules and institutions, which will be explained below. He further extends the innovation studies by suggesting “an analytical distinction between ST-systems, actors and institutions/rules, which guide actors.”[47] He states that there are six kinds of interactions between these three dimensions:

Owing to these interdependencies, without losing their identity, these social groups are aligned to each other.

> “1. Actors reproduce the elements and linkages in ST-systems in their activities […]
> 2. [E]xisting rules, regimes and institutions […] provide constraining or enabling contexts for human actors (individual human beings, organisations, groups). Perceptions and (inter)actions of actors and organisations are guided by these rules (‘structuration’) […]
> 3. [A]ctors carry and (re)produce the rules in their activities.”[48]
> 4. ST-systems form a structuring context for human actions, Geels considers this in terms of technologies, but we may include buildings or even cities.
> 5. Rules are embedded in artefacts and practices, besides actors’ minds.
> “6. Technologies have a certain ‘hardness’ or obduracy, which has to do with their material nature, but also with economic aspects (e.g. sunk costs). Because of this hardness, technologies and material arrangements may be

[41] Geels, *From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory*, 900.
[42] Ibid., 900.
[43] Ibid., 900.
[44] Ibid., 901.
[45] Ibid., 901.
[46] Ibid., 902.
[47] Ibid., 902.
[48] Ibid., 903.

> harder to change than rules or laws […] Technical possibilities and scientific laws constrain the degree to which interpretations can be made. Next to social shaping, there is also technical shaping."[49]

Geels represents the interaction between rules, actors and socio-technical in the following figure (Fig. 4-1).

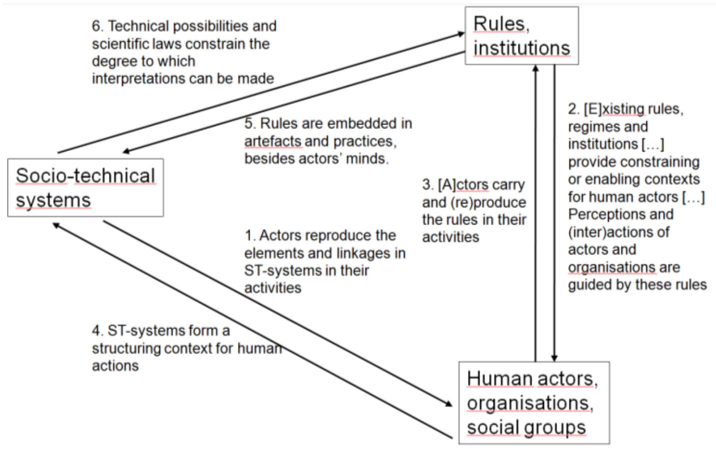

Fig. 4-1: Three interrelated analytical dimensions. Adapted from Geels.[50]

Rules and institutions have structuring effects on agents. With reference to Scott,[51] Geels divides these rules into three groups: Regulative, normative, and cognitive rules. Regulative rules refer to explicit, formal rules. From the perspective of built environment, we might include material standards, energy regulations into this category. Normative rules refer to "values, norms, role expectations, duties, rights, responsibilities."[52] These rules are learnt through socialization, and therefore they might significantly change between different countries, or even social groups. Geels explains that "[c]ognitive rules constitute the nature of reality and the frames through which meaning or sense is made."[53] The present study argues that cognitive rules have a direct correlation with the seeing domain, as they act as lenses to see the world. We can presume that all these rules are interdependent. Cognitive rules can influence as well normative and regulative rules, because people's frames give them a particular kind of reality, and norms might determine regulative rules.

Cognitive rules can influence as well normative and regulative rules, because people's frame indicate them a particular kind of reality and norms might determine regulative rules.

These rules does not exist on their own; "they are linked together and organized into *rule systems*."[54] Above, different social groups were distinguished related to their sub-functions. Agents in these groups share a set of rules, in other words, a regime, which is defined as follows:

> A technological regime is the rule-set or grammar embedded in a complex of engineering practices, production process technologies, product

[49] Ibid., 904. As will be maintained later in detail, MLP incorporates SPT into analysis, because rules have structuring effects on decision making, thus actions. Based on the Reckwitz's approach to SPT, in his words things are part of practice, hence he accepts them as elements of practice. However SPT sees structure in the form of routinized practices.
[50] Ibid., 903.
[51] W. Richard Scott, *Institutions and Organizations* (London/New Delhi: Sage Publications, 1995).
[52] Geels, *From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory*, 904.
[53] Ibid., 904.
[54] Ibid., 904.

> characteristics, skills and procedures, ways of handling relevant artefacts and persons, ways of defining problems; all of them embedded in institutions and infrastructures.[55]

In regimes, as semi-coherent sets of rules, it becomes difficult to change one rule, due to the multiple linkages among many rules. Social groups share diverse rules, and so it is possible to divide them into different regimes. However rules are not just linked to one particular regime; they are diffused over diverse regimes. This means there are linkages between regimes. These linkages explain why there are certain alignments between diverse groups. To understand this meta-coordination (Fig. 4-2), Geels suggests the concept of socio-technical regimes, and adds the following remark:

> ST-regimes can be understood as the 'deep-structure' or grammar of ST-systems, and are carried by the social groups. ST-regimes do not encompass the entirety of other regimes, but only refer to those rules, which are aligned to each other. It indicates that different regimes have relative autonomy on the one hand, but are interdependent on the other hand.[56]

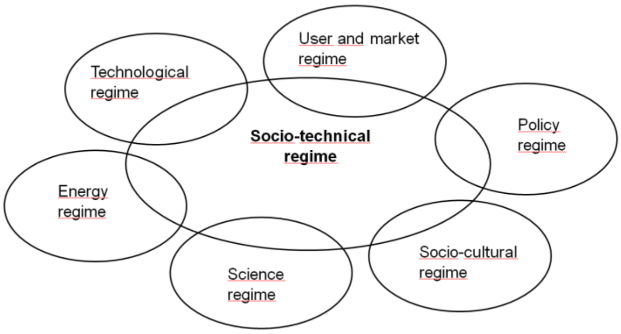

Fig. 4-2: Meta-coordination through socio-technical regimes. Taken from Geels[57]

Based on this figure, Fig. 4-3 proposes the ST-system for the built environment.

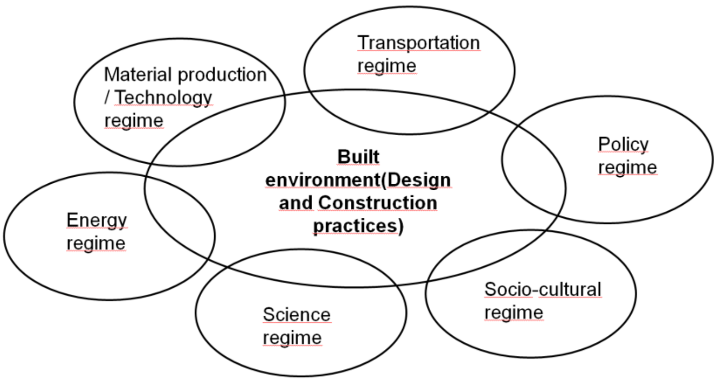

Fig. 4-3: Meta-coordination through socio-technical regimes impacting the ST-system of built environment

Rene and Kemp, and later Geels, suggest conceiving regimes as practices. Geels adds the following remark for possible misunderstandings about system and regimes:

Rene and Kemp, and later Geels, suggest conceiving regimes as practices.

[55] Arie Rip and René Kemp, "Technological Change," in *Human Choices and Climate Change*, eds. Steve Rayner and Elizabeth L. Malone (Columbus, OH: Battelle Press, 1998), 340.
[56] Geels, *From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory*, 905.
[57] Ibid., 905.

> System […] refers to tangible and measurable elements (such as artefacts, market shares, infrastructure, regulations, consumption patterns, public opinion), whereas regimes refer to intangible and underlying deep structures (such as engineering beliefs, heuristics, rules of thumb, routines, standardized ways of doing things, policy paradigms, visions, promises, social expectations and norms). So 'regime' is an interpretive analytical concept that invites the analyst to investigate what lies underneath the activities of actors who reproduce system elements.[58]

These rules are reproduced over the course of actors' actions and actors do not solely obey them, as they are intelligible agents. This aspect enables to make moves in the game (Fig. 4-4). This also alludes to the learning capacities of actors within systems. There are multiple and dynamic interactions between rule-regimes and actors; for example, there might be power relationships among different companies within the same regime or between regimes. For instance, Geels states that

> These actions maintain or change aspects of ST-systems. The dynamic is game-like because actors react to each other's moves. These games may be within groups, e.g. firms who play strategic games between each other to gain competitive advantage. There may also be games between groups, e.g. between an industry and public authorities.[59]

In ST-systems the rules of the game is not fixed, and can change over time

This indicates that in ST-systems the rules of the game are not fixed, and can change over time. However in regard to this dynamic composition of actors, included in the social groups, who share major rules, it is possible to talk about the co-evolution of ST-systems. Actually this is the basic assumption of MLP developed by Rip, Kemp and Geels.

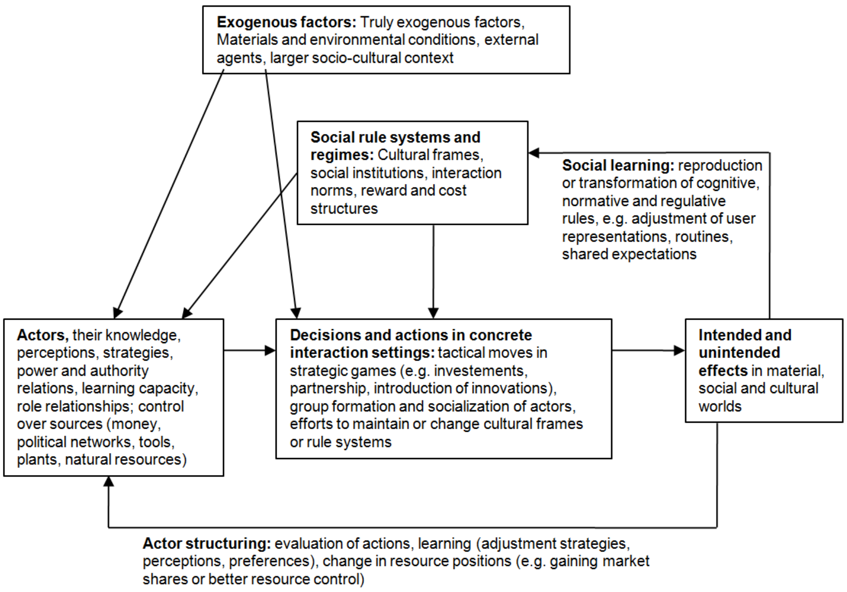

Fig. 4-4: Actor-rule system dynamics. Taken from Geels.[60]

[58] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 31.
[59] Geels, *From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory*, 909.
[60] Ibid., 908.

Understanding the transition to sustainability in the production of built environments requires, as mentioned before, a systems approach that takes into account the place in terms of social environment into which the novelty is introduced.[61] Therefore the study needs to adopt an analytical approach based on the following considerations, which are summarized by Geels as follows:

> Researchers […] need theoretical approaches that address, firstly, the multi-dimensional nature of sustainability transitions, and, secondly, the dynamics of structural change. With regard to structural change the problem is that many existing (unsustainable) systems are stabilized through various lock-in mechanisms, such as scale economies, sunk investments in machines, infrastructures and competencies. Also institutional commitments, shared beliefs and discourses, power relations, and political lobbying by incumbents stabilize existing systems… Additionally, consumer lifestyles and preferences may have become adjusted to existing technical systems. These lock-in mechanisms create path dependence and make it difficult to dislodge existing systems. So, the core analytical puzzle is to understand how environmental innovations emerge and how these can replace, transform or reconfigure existing systems.[62]

As maintained by this study as well, existing lifestyles, political agreements, and current capitalist economy have deep impact on unsustainable practices.

Researchers working on the transitions in socio-technical systems are actually divided into two camps in terms of their analytical perspective. One side considers Multi-Level Perspective (MLP) as a powerful heuristic device that conceives transition as the change from one regime to another based on the adoption of niche developments; the other side foresees the change in social practices, and considers social practice theory (SPT) for explaining these changes. In line with Hargreaves *et al.*, this study attempts to bridge these two approaches. To this end, first MLP will be explained, and then SPT will be introduced. Finally, the study will combine these approaches.

4.2.2 THE MULTI-PERSPECTIVE FOR ANALYZING SUSTAINABLE BUILT ENVIRONMENT

The multi-level perspective (MLP) is defined as “a middle-range theory that conceptualizes overall dynamic patterns in socio-technical transitions.”[63] This analytical framework conceptualizes the overall dynamic patterns within socio-technical systems, and transitions occur when there is a regime shift, and when a major change alters the way particular societal functions are fulfilled.[64] Geels describes MLP as follows:

> The MLP views transitions as non-linear processes that results from the interplay of developments at three analytical levels: niches (the locus for radical innovations), socio-technical regimes (the locus of established practices and associated rules that stabilize existing systems), and an exogenous sociotechnical Landscape […] Each ‘level’ refers to a heterogeneous configuration of elements; ‘higher’ levels are more stable than

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[61] Rip and Kemp, *Technological Change*, 338.
[62] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 25.
[63] Ibid., 26.
[64] Hargreaves, Longhurst and Seyfang, *Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory*, 1-25.

'lower' levels in terms of number of actors and degrees of alignment between the elements.[65]

MLP defines niche and landscape levels with respect to their deviances from regime level, in terms of practices or technologies.

MLP defines niche and landscape levels with respect to their deviances from regime level, in terms of practices or technologies. In this sense, Geels calls them as 'derived concepts.' As explained in detail above, regimes are analogous to Giddens' structuration theory; they stabilize practices and exert a structuring force upon novel alternatives.[66] Smith *et al.* assert that "in a Kuhnian vein, regimes tend to produce 'normal' innovation patterns, whilst 'revolutionary' change originates in 'niches.'"[67] MLP foresees a number of different patterns for transitions based on the interactions of these three levels. Before explaining these patterns, the study first briefly explains these levels.

4.2.2.1 SOCIO-TECHNICAL REGIMES: STABILITY OF EXISTING ST-SYSTEMS, PATH DEPENDENCE AND LOCK-IN

Herein the study explains how rules, regimes, or regime practices, which act as guides for perceptions and actions and have impact on stabilizing certain practices. There are several mechanisms providing this stability.

Cognitive rule, draw agents' attention, knowledge, and conception into particular directions

1. Cognitive rules, acting as the conveyer of worldviews, draw agents' attention, knowledge, and conception into particular directions. This might make people "blind to developments outside their focus."[68] Geels underlines that competencies, knowledge, and skills can be conceived as "cognitive capital with sink investments,"[69] as acquiring them would take much time. This is also the case for established firms and organizations. Normative rules stabilize certain demands, as it would not be proper to ask certain questions. Regulative rules establish certain production lines, quality standards, or legally binding contracts. Most importantly these rules are all interdependent so that changing one rule would propagate to other rules as well.
2. The practices of agents or actors, organizations are located within interdependent networks, thus mutual dependencies among each other contribute to stability.[70] This is extremely important for our case. Architectural design studios and construction firms establish networks with diverse firms. Architects usually work with the same engineering design firm; their organization reinforces over time, and this network turns into several routines.
3. Third, socio-technical systems are dependent on certain material choices, which makes them difficult to alter.[71] Geels state that "[o]nce certain material structures or technical systems […] have been created, they are not easily abandoned, and almost acquire a logic of their own."[72] Components and sub-systems represent an important source of inertia in terms of managing radical innovations. This aspect influences the stability of the building industry.

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[65] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 26.
[66] Smith, Voß and Grin, *Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and its Challenges*, 440.
[67] Ibid., 440.
[68] Geels, *From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory*, 910.
[69] Ibid., 910.
[70] Ibid., 910.
[71] Ibid., 911.
[72] Ibid., 911.

Due to the lock-in effects, innovations in regimes are entrapped to the rule-sets of regimes; therefore they occur incrementally. Before explaining how possible transitions in regimes might occur with respect to the stability in regimes, the study first explains the two derived levels defined by MLP.

4.2.2.2 NICHES

Niche activities or practices are defined as 'protected spaces,' in which pressures from regime rules are less felt. Niches enable "path-breaking, radical alternatives, whose performance may not be competitive against the selection environment prevailing in the regime."[73] Such an environment may be found in R&D laboratories, demonstration projects, or "small market niches where users have special demands and are willing to support emerging innovations."[74] Niche actors work on radical innovations, which deviate from existing regimes. The level of radicalness depends on how much the rules followed in niches deviate from regime activities. Geels maintain that these actors hope that their novelties will pass into the regime level. In regard to the structuring effects of regimes –indeed there might be more than one– niche-innovations would not fit into the current mechanisms. Finally researchers believe that a niche may have an incentive role in enabling transition. Geels defines three core processes for niche development:

The level of radicalness depends on how much the rules followed in niches deviate from regime activities.

> • The articulation (and adjustment) of expectations or visions, which provide guidance to the innovation activities, and aim to attract attention and funding from external actors.
> • The building of social networks and the enrolment of more actors, which expand the resource base of niche-innovations.
> • Learning and articulation processes on various dimensions, e.g. technical design, market demand and user preferences, infrastructure requirements, organisational issues and business models, policy instruments, symbolic meanings.[75]

In fact, in contrast to the niches explained by the literature, like eco-houses or green homes, LEED or BREEAM certified buildings are developed through the initiatives within the sector. However, this study considers the practices with LEED and BREEAM as niche activities. There are several reasons for this assumption. When compared to the number of buildings built in a year in Turkey, the number of certified (or in certification process) buildings is very low (100.764 building permit issued in 2011,[76] the number of certified/certification process buildings 183 starting from 2008 till 2012 buildings). This means the socio-technical system in Turkish building sector is guided by a dominant regime. There are highly prestigious buildings, which might deviate from regime practices, but a considerable number of buildings is path-dependant. Second, those certified are protected with financial subsidies by private companies or demonstration projects by municipalities. As will be explained further in chapter 5, in Turkey most of the certified buildings are mainly certified for gaining market advantage or to be on the forefront or again for publicity value (selling buildings). This might indicate that this niche in Turkey may not be guided by green incentives. An important issue would be to discuss how this

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[73] Smith, Voß and Grin, *Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and its Challenges*, 440.
[74] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 27.
[75] Ibid., 28.
[76] Turkish Statistical Institute, Building Permit Statics

niche is influential on making pressures on regime. Third, regardless of intent and financial sources, LEED and BREEAM represent a different type of practice. It is therefore important to underline how much they deviate from normal, stabilized, practices. Forth, while people hope for the proliferation of environmentally sensitive buildings, they are somehow afraid that these certified buildings are only built for economic reasons, so the symbolic meanings ascribed to these tools should be questioned. In fact, conceiving these practices as niche activities and pursuing an analysis based on MLP is valuable for showing the intersections between these practices with major regimes, such as energy, social and transportation.

4.2.2.3 SOCIO-TECHNICAL LANDSCAPE

At the top of all the ST-systems, the socio-technical landscape represents a highly structural and wider context, which influences both niches and regimes.[77] The landscape level includes environmental and demographic changes, shifts in political ideologies, macro-economic patterns, and cultural developments.[78] Therefore it can be considered as “the technical and material backdrop that sustains society,”[79] by providing avenues for establishing socio-technical configurations for fulfilling societal needs. Moreover, landscape can make some actions easier than others. These broad developments in landscape do not directly influence niches and regimes; they have to be perceived and translated by actors in order to influence regimes or niches.[80] In contrast, regimes directly influence actors' actions. Landscape was first developed as a level which changes very slowly. With respect to the criticism raised against this level (a residual analytical category in which all other elements can be put) Geels suggests borrowing the three types of landscape dynamics developed by Van Driel and Schot:

> (1) factors that do not change (or that change very slowly), such as physical climate,
> (2) rapid external shocks, such as wars or oil price fluctuations, and
> (3) long-term changes in a certain direction (trend-like patterns), such as demographical changes.[81]

The main promise of this level is that landscape pressures on regimes might provide opportunities for niches to develop. In fact landscape level can reinforce regime practices as well. Current regimes, including the building design and construction, are under pressure of environmental problems and broad political initiatives calling for sustainability. Smith *et al.* underline that growing environmental awareness is actually a landscape level shift, which impacts multiple regimes, hence providing opportunities for niches.[82]

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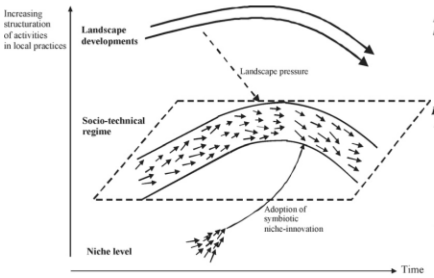
[77] Rip and Kemp, *Technological Change*, 327-399.
[78] Smith, Voß and Grin, *Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and its Challenges*, 435-448.; Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 24-40.
[79] Ibid., 28.
[80] Frank W. Geels and Johan Schot, "Typology of Sociotechnical Transition Pathways," *Research Policy* 36, no. 3 (2007), 404.
[81] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 36.
[82] Smith, Voß and Grin, *Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and its Challenges*, 441.

4.2.2.4 POSSIBLE TRANSITION PATHWAYS

Regarding the ongoing interactions between niches, regimes, and landscape levels, Geels and Schot define four possible transition pathways.

• *Transformation:* In this pathway, landscape developments exert pressure on regime practices. If niche practices or innovations are not well-developed to respond to landscape demands, regime actors "modify the direction of development and innovation activities."[83] This results in cumulative adjustment of the regime with respect to landscape pressures by taking into account niche activities. Therefore, new regimes gradually develop out of old regimes. Moreover, in this case, Geels and Schot assert that "regime actors may import external knowledge if the 'distance' with regime knowledge is not too large."[84] In this case, niche innovations are like add-on to the regime; that is, they do not alter the basic rules and architecture.[85] In this pathway, *social movements* may become important actors in mobilizing public opinion about the problems in regimes with their protests for demanding solutions.[86] Outside professional scientists, engineers, or architects might propose new alternatives, by criticizing the existing problems in regimes. These demonstrations from outsiders, if conceived feasible, might trigger regime actors in changing the course of their practices (Fig. 4-5).



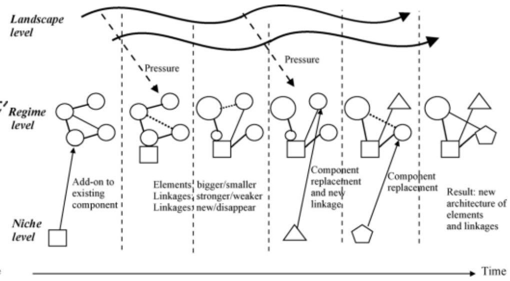


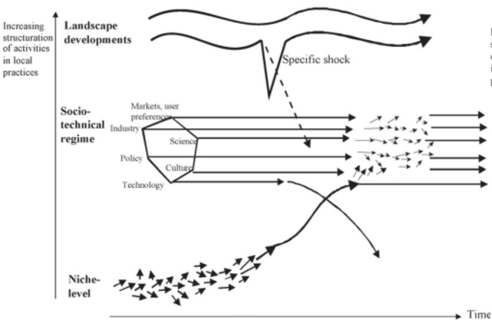
Fig. 4-5: (Left) Transformation pathway, taken from Geels and Schot[87]
Fig. 4-6: (Right) Reconfiguration pathway, taken from Geels and Schot[88]

• *Reconfiguration:* This pathway is very similar to transformation pathway, but in this case if the radical innovations, developed in niches, have symbiotic relations to the regime, they are easily adopted, through an add-on or component replacement. Geels and Schot state that "[t]hese adoptions are driven by economic considerations (e.g., to improve performance and to solve small problems), leaving most regime rules unchanged."[89] If the basic configuration of the regimes remains intact, this transition turns into a transformation pathway. In fact, adopted novelties may bring forth further adjustments and actors might generate emergent configurations between new and old elements. These developments might breed new user practices or new technical configurations, which leads the adoption of

[83] Geels and Schot, *Typology of Sociotechnical Transition Pathways*, 406.
[84] Ibid., 407.
[85] Ibid., 407
[86] Ibid., 406.
[87] Ibid., 407.
[88] Ibid., 412.
[89] Ibid., 411.

new niche-innovations. This sequential uptake of niche-innovations under landscape pressures causes major reconfigurations in the overall regime. So again a new regime grows out of old one (Fig. 4-6).[90] Geels and Schot maintain that this type of pathway might be observed mainly in distributed socio-technical systems (agriculture, hospitals, retails), which involve multiple technologies; thus transition might occur by sequences of multiple component innovations.[91] This pathway, then, indicates various similarities to the developments in green buildings, as they include more than one technology and diverse practices including designing, building and living. The study argues that for certain contexts or countries the uptake of symbiotic niche-innovations might not occur for the sole reason of its viability in existing regimes; either social movements or policies should be active for pursuing this pathway.

• *Technological substitution:* In this pathway, Geels and Schot state that when landscape exerts pressure on regimes and trigger tensions in their configuration, if, in this case, niche-innovations are well developed, they would use this window of opportunity and replace the regime.[92] Another scenario: if niche-innovations gain public recognition by building social networks or through user demands, they would replace the regime even if there is no landscape pressure (Fig. 4-7).[93]



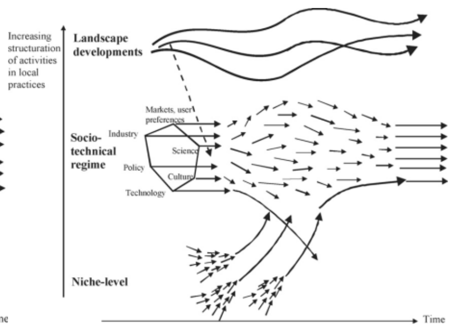


Fig. 4-7: (Left) Technological substitution taken from Geels and Schot[94]
Fig. 4-8: (Right) De-alignment and re-alignment pathway taken from Geels and Schot[95]

• *De-alignment and re-alignment:* In this pathway (Fig. 4-8), landscape pressure causes problems in regimes, called de-alignment. This prepares the ground for the formation of multiple niches, which co-exist for a while, and then re-alignment occurs around one niche, leading to a new regime.[96]

4.2.2.5 FIELD OF APPLICATION

In the field, MLP is used by two related strands of research. The first strand involves explaining historic transitions in societal functions, such as the transition to

[90] Ibid., 411.
[91] Ibid., 411.
[92] Ibid., 409.
[93] Ibid., 409.
[94] Ibid., 410.
[95] Ibid., 409.
[96] Ibid., 408.

automobiles, the rise in turbo-jet aviation,[97] the development in horticulture,[98] and improvement in sanitation.[99] These researches explain how radical innovations move towards the socio-technical regime; thus they do not deal with normative goals like sustainability per se. As mentioned above, sustainability diverges from these innovations, as it is purposeful in essence and discusses possible conditions under which sustainable transitions in energy and housing might develop.

Smith *et al.* state that the challenge of sustainable development is getting increasingly shaped by this understanding, that is, transition to more sustainable socio-technical systems.[100] Based on the literature review carried out in this study, it seems that the field of built environment has not yet internalized this approach and development is still understood to be gained from the optimization of the ties of the tripolar model. This view foresees benefit in aligning the socio-technical regimes, such as, transportation, energy, culture, policy, and technology to a sustainable path. It is only recently that we can see a few suggestions for the uptake of this innovation approach and its allied analytical models. Jensen *et al.*[101] discuss new sustainable building development sites in Denmark, which is promoted by municipalities, in steering the socio-technical regime towards sustainable construction, Smith focus on eco-housing initiatives again as a possible driver for transition.[102] Whyte and Martin suggest MLP in regard to its systemic approach as a key for researches in the built environment.[103] If "architects are both antagonists and service providers,"[104] their role in this transition would be important to adapt and then probe change in socio-technical systems.

4.2.2.6 CRITICISM ON MLP

MLP is a relatively new theory. It was first introduced in 2002 and was mainly developed to explain historical transitions. Over the years, it has attracted many researchers from different fields to explain the regime transitions in a variety of research agenda, e.g. transportation, agriculture. These applications have not only provided valuable criticisms on the core assumptions of MLP, but also helped to improve its framework. The present study has to overview these criticisms. From the onset, we should underline that MLP focus on *long-term case studies*. Therefore this study will use MLP only for making some projections about the practice with BEATs.

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[97] Frank W. Geels, "Co-Evolutionary and Multi-Level Dynamics in Transitions: The Transformation of Aviation Systems and the Shift from Propeller to Turbojet (1930–1970)." *Technovation* 26 (2006), 999-1016.

[98] Eric Berkers and Frank W. Geels, "System Innovation through Stepwise Reconfiguration: The Case of Technological Transitions in Dutch Greenhouse Horticulture (1930–1980)," *Technology Analysis & Strategic Management* 23, no. 3 (2011), 227-247.

[99] Frank W. Geels, "The Hygienic Transition from Cesspools to Sewer Systems (1840–1930): The Dynamics of Regime Transformation," *Research Policy* 35 (2006), 1069-1082.

[100] Smith, Voß and Grin, *Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and its Challenges*, 435-448.

[101] Jensen et al., *Has Social Sustainability Left the Building? the Recent Conceptualization of "sustainability" in Danish Buildings*, 94-105.

[102] Smith, *Translating Sustainabilities between Green Niches and Socio-Technical Regimes*, 427-450.

[103] Whyte and Sexton, *Motivations for Innovation in the Built Environment: New Directions for Research*, 473-482.

[104] Gino Zucchi, "Sharing Forms: 'Urbanity' as Emulation and Habit," in *Common Ground: A Critical Reader*, eds. David Chipperfield, Kieran Long and Shumi BoseMarsilio, 2012), 113-119.

• *The bias towards niche-innovations:* MLP refers usually to new technological artifacts or practices that will ultimately replace existing regimes. In fact, especially in building practices these niche developments are not necessarily new. Næss and Vogel underlines that there are often old and well-established uses (e.g. high-density urban districts, apartment buildings, bikes, streetcars, buses), which are dependent on less sustainable technologies and existing however alongside their competing regimes. They suggest increasing the market share of these environmentally favorable solutions instead of focusing on new ones.[105]

Næss and Vogel underline that current developments at the landscape level “tend to stabilize rather than disrupt the existing regime,”[106] especially in the domain of transportation with ever-increasing mobility and with the capitalist consumerist society. Obviously, barriers to sustainability, as mentioned in various occasions in this study, require changing our lifestyles. To this end, more research should be directed towards landscape level, as indicated by Næss and Vogel as follows:

> Landscape-level analyses should, however, also include critical analyses of overall political-economic structures and mechanisms acting as driving forces towards generally increased consumption levels, single-family and car-based housing and mobility schemes, and weak urban land use regulations.[107]

In this sense, they suggest focusing on political niche actors rather than expecting the required change from technological niche actors and technologies. Therefore, in the context of this study, analysis should be directed towards the established landscape level in Turkey.

Furthermore, Næss and Vogel presume that much of the literature on MLP and sustainability transitions are developed based on a tacit assumption of continual economic growth. Therefore this has clear connections with the discourse on ecological modernization.[108] They underline that this might be due to the “technology optimism inherent in the traditional MLP conception of innovative, ‘green’ technological solutions developing in niches from where they can by and large challenge and replace the existing socio-technical regime.”[109] They maintain that according to this modernization “innovation can stretch and redefine ecological limits and the production can be redirected towards environmental goals in order to decouple economic growth from environmental degradation.”[110] This is actually very much in line with the mechanistic worldview. Niche innovations redirect production towards environmental goals without altering economical growth. The problem then might not be adding new buildings but to change the overall composition of the built environment or even investigating a non-growth agenda for

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[105] Petter Næss and Nina Vogel, "Sustainable Urban Development and the Multi-Level Transition Perspective," *Environmental Innovation and Societal Transitions* 4, no. September (2012), 43.
[106] Ibid., 45.
[107] Ibid., 45.
[108] Ibid., 44.
[109] Ibid., 44.
[110] Ibid., 44.

building stock and mobility.[111] However such a non-growth can only be resolved in the landscape level, which is neglected in transition theories.[112]

• *Start and end points of transition:* Much work done by Geels, and many others are dependent on the analyst's choice: Selections of cases to research, transition start and end points, role of technology/innovation, path articulation.[113] This represents a problem in various ways: Identifying whether an innovation is radical or not is quite problematic if we are currently within a regime. Timescale used to represent case studies demarcates as well the transition pathway, because slow changes might not be included.

• *Flat ontologies versus hierarchical levels:* Shove and Walker underline that MLP framework is not suitable to study transitions, as according to their perspective innovation and changes occur only in the practices. They maintain that transitions can only be analyzed how new practices develop, stabilize and disappear based on the horizontal circulation of elements, out of which sustainable practices emerge. Following Geels[114] and Watson,[115] this study categorizes new practices in niche level, and more stabilized, or routine, ones in regime. Smith *et al.* claim that "one must not disregard the regimes that make available the material elements of a practice, and their institutions that structure the repertoire of possible practices."[116] For this study, it is then crucial to reveal how materials brought by LEED or BREEAM into practice interact with stabilized practices in regimes.

The review of this study on researches on MLP reveals that there is lack of research in explaining the interaction of rules with regimes. It would be beneficial to discuss how changes in regulative, normative and cognitive rules reflect on the regime. This is also applicable to niche innovations, in regard to their level of innovation, thus radicalness, in terms of their deviances in the rules followed. Genus and Coles underlined this in 2007[117] and since then no research seems to have worked on this gap. The current study might extend MLP, because it considers cognitive rules within the seeing domain controlling the formation of other rules, based on the seeing, knowing, and doing domains.

This study considers all these problems delineated above and uses MLP as only a *heuristic device*. As mentioned as well by Geels, this framework is not a 'truth machine'; it "guides analyst's attention to relevant questions and problems."[118] MLP enables this study to investigate possible influences of practices with BEATs, developed for another country, on overarching regimes in Turkey. The study will draw conclusions about the possible transition pathway of the system triggered by BEATs, but this pathway cannot be proved, as delineating such a pathway would

[111] Ibid., 44.
[112] Ibid., 44.
[113] Audley Genus and Anne-Marie Coles, "Rethinking the Multi-Level Perspective of Technological Transitions," *Research Policy* 37 (2008), 1436-1445.
[114] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 37.
[115] Matt Watson, "How Theories of Practice can Inform Transition to a Decarbonised Transport System," *Journal of Transport Geography* 24 (2012), 488-496.
[116] Smith, Voß and Grin, *Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and its Challenges*, 443.
[117] Genus and Coles, *Rethinking the Multi-Level Perspective of Technological Transitions*, 1436-1445.
[118] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 34.

require at least ten years of investigation. Therefore this study will only offer an interpretation. Furthermore, in regard to the importance of agency in innovation studies, it integrates SPT into analysis. This integration has been applied recently by Hargreaves *et al.*[119] and Watson for the study of transportation systems.[120]

4.3 SOCIAL PRACTICE THEORY

MLP considers transitions in socio-technical regimes within systems. SPT, following Giddens, takes up a different unit of analysis, that is, practices, rather than "individuals, citizens, societies, social groups or even socio-technical systems."[121] Consequently, transition is conceived as transitions in *practices*. As will be maintained later, practices are part of socio-technical regimes.

Currently there is no unequivocal approach to practice in SPT; indeed there are a number of versions exemplified in authors such as Bourdieu, Giddens, late Foucault, Garfinkel, Latour, Taylor or Schatzki. However the literature on transitions deployed in the field is based on an 'ideal type' of practice theory introduced by Andreas Reckwitz, who defines practice as follows:

> routinized type of behavior which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. A practice – a way of cooking, of consuming, of working, of investigating, of taking care of oneself or of others, etc. – forms so to speak a 'block' whose existence necessarily depends on the existence and specific interconnectedness of these elements, and which cannot be reduced to any one of these single elements. Likewise, a practice represents a pattern which can be filled out by a multitude of single and often unique actions reproducing the practice. [122]

Practice theory broadens the scope to a meso-scale and look into practices that are shared collectively.

This definition might readily be read, in common usage, as the habits of an individual. In this sense, the single individual –as a bodily and mental agent– is actually the carrier of a practice, that is, carries routinized ways of understanding, knowing and desiring. However practice theory broadens the scope to a meso-scale and look into *practices* that are shared collectively. Meanings, purposes, understandings and know-how are not attributes of human subject, they are "elements and qualities of a practice in which the single individual participates."[123] This understanding therefore focuses on practices, "rather than either human individuals or technological systems, or discourses (which can themselves be seen as emergent from practices)."[124] Reckwitz defines the core concepts of practice as follows: Body, mind, things, knowledge, discourse/language, structure/process, and agent/individual.

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[119] Hargreaves, Longhurst and Seyfang, *Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory*, 1-25.
[120] Watson, *How Theories of Practice can Inform Transition to a Decarbonised Transport System*, 488-496.
[121] Elizabeth Shove and Gordon Walker, "Governing Transitions in the Sustainability of Everyday Life," *Research Policy* 39, no. 4 (2010), 471-476.
[122] Andreas Reckwitz, "Toward a Theory of Social Practices : A Development in Culturalist Theorizing," *European Journal of Social Theory* 5, no. 2 (2002), 249-250.
[123] Ibid., 250.
[124] Watson, *How Theories of Practice can Inform Transition to a Decarbonised Transport System*, 490.

In this theory, knowledge gains another meaning, knowledge always require human actions, and involves thinking. Schatzki states that "knowledge is no longer even the property of individuals, but instead a feature of groups, together with their material setup."[125] A certain way of doing, therefore includes both the two dimensions of knowledge, know-that and know-how. However there are slight differences for becoming a practitioner. It is possible that people recruited in practices are not only engaged in learning, but also contributing to a "common 'community of practice.'" For playing the game, for becoming part of practice, Brown and Duguid state that: "The central issue in learning is becoming a practitioner not learning about practice… Learners are acquiring not explicit, formal "expert knowledge", but an embodied ability to behave as community members."[126] They further add that these communities are emergent. Their shape result from the process of their activities, "opposed to being created to carry out a task."[127] This point reveals that learning is not just acquiring knowledge in the sense of know-how, but it involves the performance of doing.

The patterns, introduced by Reckwitz, are formed out of routine actions, which generate "historically and collectively formed"[128] practices-as-entities, distributed across space and time. This entity is influential on moments of activities and for SPT this routinization represents the nature of social structure.[129] Practices-as-entities are shared by people aiming to accomplish the practice. People know the elements that shape the practice, such as the things, the bodily activities, know-how, the norms, and the rules. Watson claims that "[a]s an entity, a practice is in some sense transcendent of individual incidences of its doing."[130] In fact, practices are part of our daily life in that they exist as performances, which are also termed as practices-as-performances by Schatzki.[131] The performances, structured by the pattern brought by the practice-as-entity, again fill out, reproduce, sustain or change the pattern. So the integration of the constitutive elements of practice (meanings, competences, materials) in each performance might be subject to change as well. However, these performances, not only because of routine, but also due the structuration of available materials or institutions in landscape level might be stabilized. For Schatzki, "both social order and individuality … result from practices."[132] This contention transcends the details of doing, and brings practices to the center stage, where the social is found. In fact, one should also needs to learn in mind that discursive practices are also a routinized way of ascribing meaning to certain rules, objects or ways of doing.[133]

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[125] Schatzki, Theodore R., "The Pratice Turn in Contemporary Theory," 12
[126] Brown and Duguid cited in Pantzar and Shove, *Understanding Innovation in Practice: A Discussion of the Production and Re-Production of Nordic Walking*, 448.
[127] Brown and Duguid cited in Ibid., 448
[128] Schatzki cited in Hargreaves, Longhurst and Seyfang, *Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory*, 1-25.
[129] Reckwitz, *Toward a Theory of Social Practices : A Development in Culturalist Theorizing*, 255.
[130] Watson, *How Theories of Practice can Inform Transition to a Decarbonised Transport System*, 489.
[131] Hargreaves, Longhurst and Seyfang, *Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory*, 1-25.
[132] Schatzki,
[133] Reckwitz, *Toward a Theory of Social Practices : A Development in Culturalist Theorizing*, 255.

Practices are recruited in a continuum with various practices.

Practices do not exist alone; they are recruited in a continuum with various practices. In their daily life individuals are in the midst of diverse practices. According to Reckwitz's approach to SPT, "the individual is the unique crossing point of practices, of bodily-mental routines."[134] Daily life and also the working environment are composed of doing various practices. Thus there are relations between practices, which are not only interdependent but also complementary to each other. This means there are *systems of practices*. By way of illustration, the architect hands the production details to diverse sub-contractors, e.g. based on architect's drawing one sub-contractor produces window framings, another one constructs the roofing. The architect's practice disseminates into diverse practices.

4.3.1 CHANGES IN PRACTICES

According to Shove and Walker, the "socio element of socio-technical change entails that innovations are shaped by social processes rather than to the ways technical systems are implicated in defining and reproducing daily life."[135] They consider socio- in socio-technical as forms of practical know-how, routines, and expectations. These features stabilize and sustain practices and may take part in incumbent regimes.[136] For theories of practice, it is human actions that provide meaning and stability to social order and change. They therefore prepare conditions for future innovations.[137]

In terms of climate change, Shove underlines the importance of understanding the trajectories and careers of resource intensive practices. This means identifying elements recruited in these practices, delineating their history (since elements are also outcomes of past practices), and processes of their recruitment and defection. Shove suggests that researchers should ask the following questions:

> how are people drawn into more or less sustainable practices and how do their lives and careers sustain the lives and careers of the practices they reproduce?[138]

According to Shove, stimulating long-term transformation requires the following steps: "[E]ngendering long-term transformation in what counts as a normal and acceptable way of life depends on reconfiguring the elements of practice; relations between practices, and patterns of recruitment and defection."[139] Researchers following this approach are mainly interested in changing the contours of practices-as-entities, as a consequence changing the elements sustaining the permanence of unsustainable practices.[140] So they define innovation not as the transition of regime, but they consider innovation in practices and claim that:[141]

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[134] Ibid., 256.
[135] Shove and Walker, *Governing Transitions in the Sustainability of Everyday Life*, 471.
[136] Ibid., 471.
[137] Watson, *How Theories of Practice can Inform Transition to a Decarbonised Transport System*, 489.
[138] Shove, *Putting Practice into Policy: Reconfiguring Questions of Consumption and Climate Change*, 5.
[139] Ibid., 5.
[140] Shove and Walker, *Governing Transitions in the Sustainability of Everyday Life*, 471-476.; Shove, *Putting Practice into Policy: Reconfiguring Questions of Consumption and Climate Change*, 1-15.
[141] Their interest therefore diverges from researchers, who invoke theory of practice to enrich knowledge of consumer behavior. Ibid., 5.

> we draw attention to the horizontal circulation of what we describe as the 'elements' of practice and comment on the extent to which images, meanings, technologies and forms of competence travel within and between 'regimes'. We suggest that opportunities for effective intervention may lie in the generation and circulation of elements of which variously sustainable practices are made.[142]

Historically past practices are also keys for promoting more sustainable practices for two reasons: First, in contrast to the transitions framed in MLP, old, but sustainable practices, which disappeared or remained only in niche level, can be regained;[143] Second, past performances are vital for the accumulation of know-how and competences. Shove refers to Bourdieu's well known concept of *habitus* on this issue: "[T]he idea of *habitus* provides a means of bridging between the cumulative (and unequal) effects of past experiences, resources, dispositions and tastes, and the content and character of future-oriented aspirations and opportunities."[144] Moreover habitus means 'the feel for the game,' which might be thought as practices-as-entities that have disappeared, but still existing in terms of valued pursuits. These pursuits might be the result of "dialectical interaction between individual and institutional projects."[145]

This strand of research conceives the landscape level, as 'macro'-level, in terms of "dominant institutional project (i.e. those which command time, resources and attention), [which] are complex amalgams of past trajectories and current aims and aspirations, many of which are materially sustained and reinforced by the state."[146] Shove claims that issues of sustainability are hidden as well in this level in the form of especially reproduction of social institutions, which include "systems of provision and systems of provision and consumption, economic relations."[147] Here, we may include especially the spatial design of cities with their structuring effects on many practices as the place for performance enactment, which has also entrapped built environments into unsustainable conditions. Actually these understandings are already explained for the landscape level conceived in MLP. Landscape level, as the locus of governmental decisions, reproduces these institutions. As already termed above, they define rules, which constitute the versions of "normal and acceptable ways of life."[148] Below, the study reviews the model developed by Shove based on this understanding.

4.3.2 MODEL FOR ANALYSIS

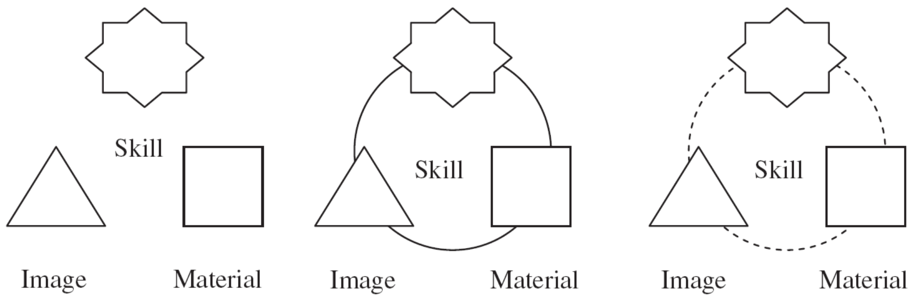
Reckwitz's comment on about the *interconnection of elements* (including "'bodily knowledge, forms of mental activities, "things" and their use,'"[149]) is seen as a key by Shove and Pantzar to develop "a dynamic analysis both of the formation,

[142] Shove and Walker, *Governing Transitions in the Sustainability of Everyday Life*, 472.
[143] Actually this approach to past or existing practices is already explained in the previous section, with reference to Næss and Vogel, *Sustainable Urban Development and the Multi-Level Transition Perspective*, 36-50.
[144] Shove, *Putting Practice into Policy: Reconfiguring Questions of Consumption and Climate Change*, 11.
[145] Ibid., 11.
[146] Ibid., 11.
[147] Ibid., 11.
[148] Ibid., 11.
[149] Reckwitz, *Toward a Theory of Social Practices : A Development in Culturalist Theorizing*, 249.

reproduction and dissolution of practice, and of cumulative, mutually influential, but emergent and unplanned relations between practices."[150] They suggest three possible ways through which new practices might develop: (1) The change of elements (know-how, materials, understanding, meanings, shared knowledge…); (2) The change in the population of 'carries' of the practice; (3) Change in the relationships between practices.

The dynamic analysis defined by Shove and Pantzar pertains to the first way. They maintain that changes in elements might occur in two ways: (1) The first one, which seems to be more likely than the second, is novel combinations of existing elements; (2) The second one is the introduction of new elements.[151] From the onset, this proposition alludes to the notion that elements can endure, without being part of a particular practice, or vice versa elements might be an outcome of a practice. This proposition considers not only the historical background, but also the future of elements, as elements can be transformed as of being routinely involved in practices.[152] For analyzing the existence, persistence and disappearance of practices, Shove and Pantzar identify three possible formulations in theory:

> One in which the constituent elements of practice (things – which we term *material*; bodily knowledge, *competence* or *skill*; and mental activities – specifically symbolic *meaning* and *image*) exist but have yet to be integrated; a second in which they are indeed actively interconnected, and a third in which those sustaining links are no longer made.[153]



Proto-practice	**Practice**	**Ex-practice**
Pre-formation	Formation and reformation	De-formation
Links not yet made	Links being made and sustained by a circuit of reproduction	Links no longer being made

Fig. 4-9: Proto-practices, practices and ex-practices. Taken from Pantzar and Shove[154]

This framework (Fig. 4-9) suggests that "practices and systems of practices should not be seen as stable and fixed to phenomena without history or future,"[155] and enables one to think about the integration of elements (material, image, skill) to form 'a practice,' and integration of practices to form more complex systems of

[150] Pantzar and Shove, *Understanding Innovation in Practice: A Discussion of the Production and Re-Production of Nordic Walking*, 450.
[151] Ibid., 450.
[152] Ibid., 450.
[153] Ibid., 450.
[154] Ibid., 450.
[155] Ibid., 450.

practices.[156] This study conceives architectural design and construction process as routinized practices and foresees benefit in adapting this framework into the design process of architects. This explanation will be introduced in the following sections.

4.3.3 ANALYSIS OF SPT AND MLP ON SOCIO-TECHNICAL TRANSITIONS

Giddens explains the ‘duality of structure,’ where structures “are both medium and outcome of practice.” There is a dual relationship between them. There are major differences between MLP and SPT according to Reckwitz: The definition of regime and how it is produced; their conception of transition. In SPT, practices-as-entities structure future performances, in MLP structures are considered as regimes, that is, ‘rule sets’ or technologies that guide the development of socio-technical systems.[157] Actually practices-as-entities include the material and rule dimensions but it is the individuals, agencies through the repetition of same performances and the integration of same elements to the practice generate practices-as-entities, including the reproduction of institutions, which therefore become a structure in the regime. Moreover, while MLP considers transitions in regimes, SPT considers it in practices. In fact, Smith *et al.* argues for the vertical dimension in practices due to different degrees of stability.[158] Actually both Geels and, into some extent, Shove attempt to integrate their theories. Geels claims that

Practices-as-entities include the material and rule dimensions. but it is the individuals, agencies through the repetition of same performances and the integration of same elements to the practice generate practices-as-entities.

> there are similarities in the kinds of phenomena of interest and one could reformulate practice theory in MLP-terms (and probably the reverse as well): stable/routinized practices can be seen ‘regimes’, whereas emerging fluid practices can be seen as ‘niche’.[159]

Then regimes represent practices-as-entities. Without the reproduction of rules in practices, it would therefore become difficult to change the regime. This is also the contention of this study, and it has recently been applied by Watson, who recast socio-technical systems as systems of practice.[160] Watson states that

> The concept of systems of practice aims to capture, simultaneously, how far practices are embedded in systemic relations constituted first by relations with other practices; and second also through the systemic elements – including infrastructures, technologies, rules, norms and meanings – which those practices constitute and sustain.[161]

SPT does not include possible influences of landscape level onto the reproduction of practices. However there are a number of important issues here. Regimes provide a number of key elements to practices, especially in terms of transportation regime, infrastructure. Another important issue is that the landscape level in design and construction regime is cities. How people think and act or how they do in a given context is conditioned by seminal deep structures. Structures, regimes or practices-as-entities, such as energy politics, transportation, and infrastructures reproduce current unsustainable lifestyles. They create path dependency for

[156] Ibid., 450.
[157] Smith, Voß and Grin, *Innovation Studies and Sustainability Transitions: The Allure of the Multi-Level Perspective and its Challenges*, 441.
[158] Smith et al. cited inHargreaves, Longhurst and Seyfang, *Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory*, 1-25.
[159] Geels, *The Multi-Level Perspective on Sustainability Transitions: Responses to Seven Criticisms*, 37.
[160] Watson, *How Theories of Practice can Inform Transition to a Decarbonised Transport System*, 493.
[161] Ibid., 493.

decisions taken to render first the buildings and then the communities sustainable. Current structures in these fields embed a host of barriers to action, as well as being influential on the pursuit of sustainable building designs.

While SPT enables to foresee the consequences of the process in the practice in routine processes, MLP might explain how the dissemination of practices with BEATs are constrained or enabled by the major construction, planning and transportation regime or in which ways BEATs might foster a transition.

4.4 DESIGNING AS PRACTICE AND DESIGNS IN PRACTICE

This study intends to investigate innovation in design practices. When this study first started, it had the intention to study how BEATs interact with the design thinking of the architect, in terms of their cognitive abilities, and how possibly BEATs limits design alternatives. The literature review on design practices undertaken by this study revealed that accounts on architectural design process mostly focus on design thinking in terms of describing how designers do things. As there is no possibility to understand what goes in designers' minds, the literature focus on explaining designers' thinking. They rarely study the world, within which the designer works. This understanding has critical drawbacks as "their research assumes there are clear boundaries between the designer and the worlds s/he is in."[162]

Researches focusing on cognitive abilities of designers rely on protocol analysis, which is basically made in experimental settings, in which individual designers are assigned to design artificial exercise. The recorded design process is then analyzed based what designers says and what they do. These researches present substantial findings about the nature of designing and design problems.[163] Their findings can guide researches on design practices especially in understanding the co-evolution of design problems and solutions.[164] However they do not equip researchers in explaining how this practice has formed, as they rely on "a version of design thinking as a simple form of information processing with inputs and outputs."[165] Another research track in the field undertakes an ethnographic approach to design thinking and does not make a distinction between designer and world, or researcher and object of study "and produce 'thick description' of what goes on during designing."[166] The premise of this strand is that they produce knowledge about situated actions of designers. However, they do not take into account the influences of material or technological culture, that is, "the situated nature of knowledge production and the institutions that serve to validate it."[167]

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[162] Lucy Kimbell, "Rethinking Design Thinking: Part I," *Design and Culture* 3, no. 3 (2011), 296.
[163] Kees Dorst, "The Problem of Design Problems," in *Expertise in Design - Design Thinking Research Symposium 6*, eds. Nigel Cross and Ernest Edmonds (Sydney: Creativity and Cognition Studios Press, 2007).; Nigel Cross, *Designerly Ways of Knowing* (London: Springer-Verlag, 2006).Donald A. Schön, *The Reflective Practitioner* (New York: Basic Books.
[164] Kees Dorst and Nigel Cross, "Creativity in the Design Process: Co-Evolution of problem–solution," *Design Studies* 22 (2001), 425-437.
[165] Kimbell, *Rethinking Design Thinking: Part I*, 297.
[166] Ibid., 297.
[167] Lucy Kimbell, "Beyond Design Thinking: Design-as-Practice and Designs-in-Practice" (Manchester, CRESC Conference, September, 2009).

While these research tracks have made important contributions to the field, it remains insufficient in explaining how the routine practices have taken this form, and routinized, and “how institutions take shape and authorize some kinds of knowledge, and not others, and some kinds of discourses, and not others.”[168]

Over the course of case studies, the author of this study has realized that the routine practices of architects, learnt or shaped and stabilized over the years, might be the main locus of investigation. BEATs seem to change the routine and equip the designers with new elements, like the use of new materials, owing to integrated design process new know-how. This study considers architectural design practices as a routine. Swidler shares the following example to explain about the promise of conceiving the formation of routines in designing:

> practice theorists would note that long before the architect could draw up plans for the house, constraints on the possible design of the house were built into taken-for-granted practices on two fronts. First, the architect assumes the standard kinds of materials that are available, and ignores the potentially infinite set that is unavailable. The standard sizes and properties of bricks and mortar, poured concrete and steel girders, door-frames and skylights, provide the ingredients from which the architect assembles his plans. Like composers who seek to write music for which there are no instruments, architects will be unable to build houses that require materials no one can make.[169]

The present study argues that beyond the material realm, there are several taken-for-granted decisions and routine design processes supported by the socio-technical regimes forming the socio-technical system of built environment. The cognitive abilities of architects are influential on the design decisions, detailed as well in this study in the sections to come, but it is these routines that produce the outcome. Designing means actually creating always something new, so innovation may not lie in the cognitive abilities but in the changes of routines.

While these problems in examining design process were on the mind of the author of this study, the author came across a very recent Ph.D. dissertation, written by Cucuzzella.[170] In her research, she studied the architectural design projects submitted for architectural competitions, for which earning a LEED certificate was a prerequisite. She used design thinking theories, especially Schön and Cross, in analyzing the impact of LEED on the judgment process and design thinking in architectural projects and on the evaluation of jury members. The major conclusion of this study:

> LEED can be a rating system that imposes an anti-design thinking approach for architectural design practice when seeking to develop a project in a context of sustainability. In this sense, when LEED is adopted in such a way, it may be counter-productive since it defeats the purpose of its intention. This is because it can reduce the design situation into a problem-solving exercise

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[168] Ibid.
[169] Ann Swidler, "What Anchors Cultural Practices," in *The Practice Turn in Contemporary Theory*, eds. Theodore R. Schatzki, Karin Knorr Cetina and Eike von Savigny (New York, NY: Routledge, 2001), 89.
[170] Cucuzzella, *Design Thinking and the Precautionary Principle: Development of a Theoretical Model Complementing Preventive Judgment for Design for Sustainability Enriched through a Study of Architectural Competitions Adopting LEED*, 376.

> since the reflective part has been overwhelmed by the technical rationality that the system of LEED in itself engenders.[171]

Therefore the author of this study has shifted the course of analysis of this current study to focus more on designing as a routine practice in order to include the influence of other interested parties in designing and further the research field on BEATs. The study explains previous works on design thinking, as they have produced valuable knowledge about the nature of design problems and cognitive abilities of architects pertaining to the routine of designing. Furthermore, this reference to this research track enables to understand one particular epistemological problem while designing with BEATs. To the best knowledge of this author, there is only one very recent research by Kimbell that suggests conceiving design practices based on SPT; however she also claims that her suggestion is not fully elaborated and still requires further research.[172]

Within an era, in which sustainability has become an imperative for all practices, recasting a research on practices in designing may be cast within the political, socio-cultural, and economic developments. In this sense, theory of practice as framed by Shove and Pantzar's model of practices, along with the levels defined by MLP, allows this study to understand first designing as practices-as-entities in the regime and designing as practices-as-performance developed in niches.

4.4.1 DESIGNING AS PRACTICE

Chapter 2 defined the interdependence of seeing, knowing, and doing domains. This model developed by Sterling is suggested against the so-called Cartesian dualism underlying modernist, mechanistic thinking, which triggered the divide between subject/object, human/nature, and body/mind. This model aimed to bring an approach towards systems thinking. Fundamental changes required towards a regenerative paradigm are explained to lie in changing these domains. Doing as reflected in practice is never detached from ontology and epistemology; hence know-how, body, and mind are the basic elements for a particular way of doing practice.

Kimbell claims that "[p]ractice theory offers a way to see design activity as distributed across a number of different people and artifacts that together enact designing and designs."[173] Designing as practice means that there are "habitual, possible rule-governed, often routinized, conscious or unconscious"[174] practices, which are embodied and situated for particular design projects. Kimbell states that:

> What designers know, do, and say is constituted by and co-constitutes what is possible for designers to do, know, and say (and what is possible for them in particular places and at particular times). An attentiveness to practice orients the researcher to how knowing, doing, and saying constitute and are constituted in relation to other elements of a practice.[175]

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[171] Ibid.
[172] Lucy Kimbell, "Rethinking Design Thinking: Part II," *Design and Culture* 4, no. 2 (2012), 143.
[173] Ibid., 133.
[174] Ibid., 135.
[175] Ibid., 133.

She is definitely pointing to the role of cognitive, regulatory and normative rules as explained by Geels, and also showing the materiality active in designing. Not all design practices are the same around the world. Each country or each culture has its own way of doing things. In terms of materiality, designing as practice involves not only artifacts used in the doing, like CAD drawings, or more developed BIM technologies, but also previous design artifacts, like previous designs of hospital, houses, or materials used in construction. This allows the research to focus on the contribution of new elements into process and as a result how the new design process deviates from previous enactments. Therefore the intention is not to study individual skills or knowing, but to study the work of professionals in their practices. The following remark by Kembell explains the premise of this approach as follows:

> This way of thinking of design sees it as a situated and distributed unfolding in which a number of people, and their knowing, doing, and saying, and a number of things, are implicated.[176]

If we turn to object study, practices with BEATs might deviate from normal practice, that is, practices-as-entities, as there are new elements within this practice-as-performance (for example the checklist of BEATs). As maintained before, level of innovation in practice is defined as the degree to which rules of the niche diverges from the regime rules. In terms of practice, this would translate as how much the rules integrated into process deviates from the ones in the regime level.

Analysis of the case studies carried out by this study then requires a framework developed based on SPT. In this sense Shove and Pantzar's model seems to be a powerful sketch to start with. Yet in designing (doing), there are different elements involved in practices. SPT focus on the designers' routines in designing. However in order to delve into routines, as has been discussed veya suggested above, there are a number of key issues that the study should borrow from researchers on design thinking.

4.4.1.1 DESIGNERLY WAYS OF KNOWING, VALUES, AND SKILLS

Coles and Norman state that knowledge, skills and values possessed by design professionals are seen to be the influential on the design-decision making process.[177] While designing, architects must employ a wide variety of knowledge. There is a key difference between knowledge and information. Information may come from many sources (courses, books, conversation). However "it is not only until this information has been assimilated by the designer that it can be referred to as knowledge."[178] This is an important point for this study, as assessment tools spread probably information in the form of "know that." We might translate this into the following form: "If you reduce your energy consumption, you earn 10 credits, to justify this you need to show the energy model." Then the important step in designing is to translate this "know that" or information into "know-how." It is at this step, that is, translation of this information into knowledge that previous experiences or in general previous practices might be influential.

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[176] Ibid., 133.
[177] Rhoda Coles and Eddie Norman, "An Exploration of the Role Values Plays in Design Decision-Making," *International Journal of Technology and Design Education* 15, no. 2 (2005), 155-171.
[178] Ibid.

The seeing and knowing domains actually refer to this distinction, because knowing depends on our epistemological constructs and beliefs. The architectural discipline conveys a certain type of knowing and doing, which always involves body and mind. So knowledge and actually know-how depends on mental and body, what Pallasmaa calls "Thinking Hand." Knowledge as an element of practice does not equip the practitioner only with information, it always carries the "designerly way of knowing."

Even though depending on diverse epistemologies, researches in the sciences – here I refer to sciences such as, physics, biology, and chemistry– have so far established various criteria to justify their kind of knowledge. In contrast to scientists, whose aim is to define the components of existing structures, designers "try to shape the components of new structures."[179] Designs are the outcome of objective and subjective decisions.[180] This duality reflects also on the dichotomy of sets of epistemological perspectives of the researches on design processes: Positivism and constructivism. The positivist approach draws possible inferences from the scientific methods for a rational way of treating creative design problems. The positivist approach holds that processing the sensory data, which are gained from an objective world, through a priori categories enables the subject to know the object.[181] The constructivist one deals with making that knowledge by investigating design-based practice. In this sense it involves a phenomenological perspective as it conceives the environment and history of the subject.[182]

One objection to the positivist approach is related with the nature of design problems. Researches in the field converge on the impossibility to define design problems, since they are ill-defined, or in Rittel's words, they are "wicked problems."[183] They are not amenable to decomposition, thus to a positivist and inductive, mechanistic approach. To overcome this problem, one of the main pioneers of constructivist approach, Donald Schön proposes an epistemology based on the investigation of practice, because practice is "implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict."[184] That is what he calls "reflective practice." In line with Schön, Nigel Cross states that an appropriate paradigm for design research is still building and the design epistemology lies in the study of "designerly ways of knowing."[185] He identifies five aspects of "designerly ways of knowing:"

- Designers tackle 'ill-defined' problems.
- Their mode of problem-solving is 'solution-focused'.
- Their mode of thinking is 'constructive'.

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179 Christopher Alexander cited in Cross, *Designerly Ways of Knowing*, 97.
180 Bartneck (2008), for example, points to the overlaps between the quality criteria of science and design, but they are inefficient in enhancing the formation of a proper epistemology.
181 Dorst, *The Problem of Design Problems*; Kees Dorst, "The Problem of Design Problems-Problem Solving and Design Expertise," *Journal of Design Research* 4, no. 2 (2004).
182 Ibid.
183 Horst Rittel, "On the Planning Crisis: Systems Analysis of the First and Second Generations," *Bedriftsokonomen*, no. 8 (1972), 390-396.
184 Schön cited in Cross, *Designerly Ways of Knowing*, 99.
185 Ibid.

- They use 'codes' that translate abstract requirements into concrete objects.
- They use these codes to both 'read' and 'write' in 'object languages'[186]

If the designer uses this epistemology in designing, then the design research should follow this path. In a similar vein Gadamer points out that "the basic operation in the acquisition of knowledge" is interpretation, which is formed of two activities: Objective interpretation and subjective interpretation. While objective refers to "what the thing itself already points to," the interpretative one questions the "attribution of value to something."[187] While referring to design processes, Dorst states that "the type of interpretation that is dominant varies through the phases of design activity, and across design situations."[188] Therefore, an epistemology suitable for the design process and consequently for the researches on design processes should conceive ways of knowing the interaction between the subjective and objective decisions.

The complexity of the design process to achieve sustainable projects requires more than 'technical know-how.' Operating within a learning system by the means of holistic design thinking is at the core of integrated design process (IDP). The researches should therefore question whether these tools foster these skills in design teams. Furthermore, in the field of sustainability, the values of design professionals are important during the design process. BEATs from a context-independent approach define weightings to criteria. In this respect they insert a certain value to design variables in advance (e.g. the accent put on energy conservation against water consumption).

4.4.1.2 A FRAMEWORK FOR ANALYSIS

Shove and Walker, Shove and Pantzar, and Watson undertake SPT to study mechanisms of reproduction and innovation in daily life practices. They do not make an analysis of situated ethnographies of practice, nor are they interested in domain practices. In contrast, this study considers BEATs as a new structure, which carries with it a certain practice, inserted into a certain context, Turkey, and into architectural design process, thus into practices. Again this study is interested in the possible reproductions of practices with BEATs; so it is cast as a domain of practice in relation with the overarching socio-technical system generating the built environment.

In light of the above discussion, to analyze the case study projects certified/or in the certification process with LEED or BREEAM in Turkey, the study develops the following framework as a heuristic device.[189] In contrast to the model of Shove and Pantzar, which is developed for practices across time and space, this framework is conceived for a domain. The first framework below (Fig. 4-10) is developed for what might be a practice-as-entity in the field of architecture, the second (Fig. 4-11) represents what might be the elements introduced within practices with BEATs. In developing this framework, the study included as well the institutional factors, or

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[186] Ibid., 12.
[187] Dorst, *The Problem of Design Problems-Problem Solving and Design Expertise*
[188] Ibid.
[189] In chapter 5, details about 'normal' practice and its routine process in Turkey will be detailed.

the “rule sets” defined in MLP. The design practices mean the overall array of possibly rule-governed, routinized actions.

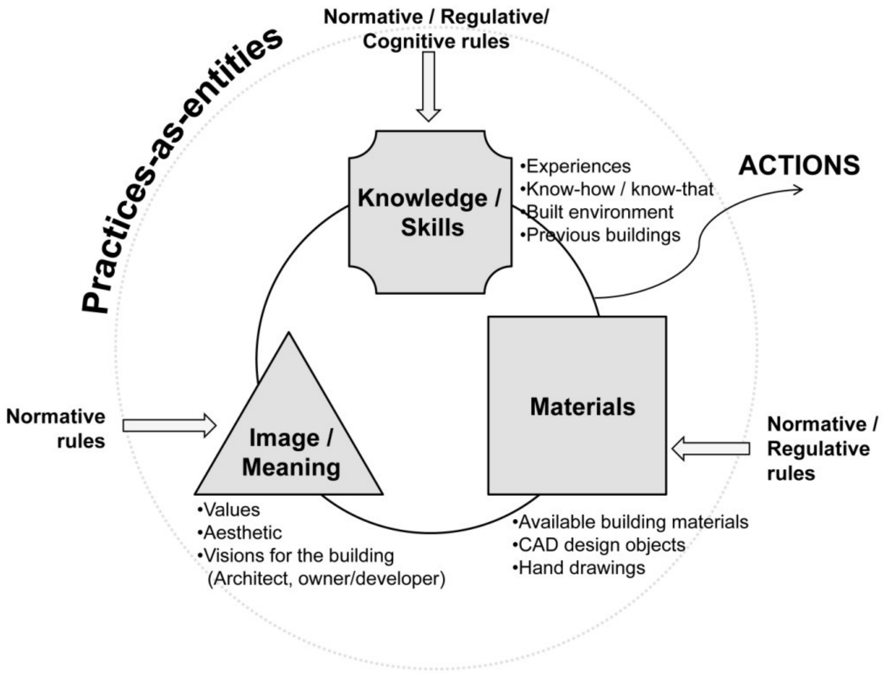

Fig. 4-10: Practice model for architectural design practices

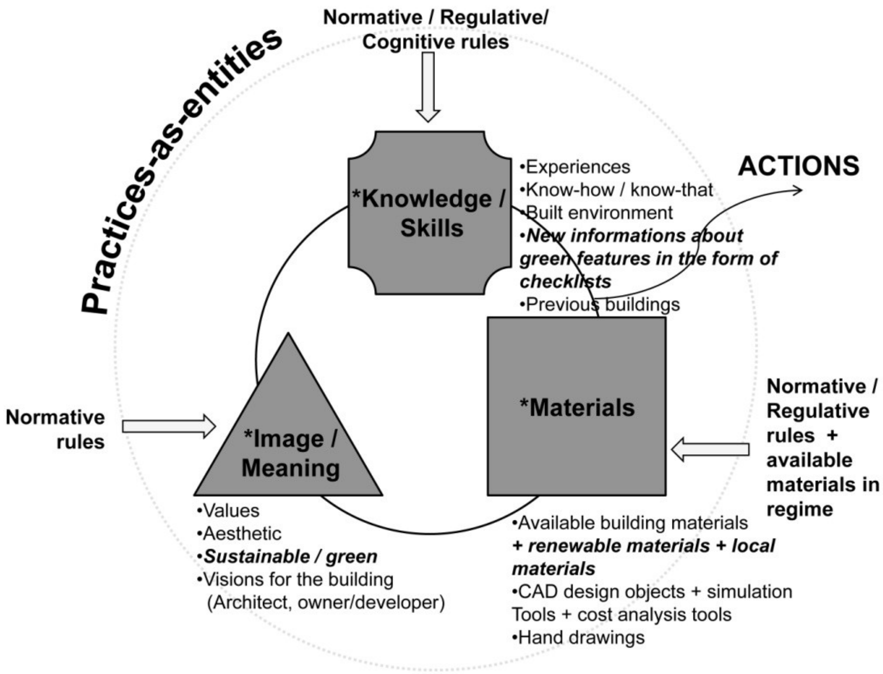

Fig. 4-11: Proto-practice model for practices with BEATs

For the study of design process or practices with BEATs, answering the following questions are crucial for this study:

1. What is normal practice?[190]
2. Is it possible to observe that inclusion of new elements into practice alters the actions and therefore the ultimate design? What are the implications of the recruitment of new elements on routine process?
3. Does the inclusion of new elements alter the interdependencies of elements?
4. Reckwitz states that "the 'breaking' and 'shifting' of structures must take place in everyday crises of routines, in constellations of interpretative interdeterminacy and of the inadequacy of knowledge with which the agent, carrying out a practice, is confronted in the face of a 'situation.'"[191] How in possible breaks due to BEATS do routines deviate from regime rules?
5. With reference to the learning activities needed for developing niche activities into mainstream practice, is it possible to state that designers have become practitioners of a new design process, or did they only learn about the practice?

4.4.2 DESIGNS IN PRACTICE

Chapter 3 indicated that for the context of thermal comfort, technologies are integrated into user's practices with varying configurations. This aspect is developed over the practice-oriented consumption studies.[192] Even though designers and constructors finish their work, the activity of designing is not still over. Users and stakeholders, through their practices taking place inside/outside these designs, redefine the meaning and the use of designed artifacts, because designs become element of their practices.[193] Designers envision a life, materialized in buildings. Buildings and urban setting have essential roles in inscribing a certain way of life. To this end, be it buildings or products, they are all immersed into the practices as new materials. On this issue Shove and Pantzar state that:

> we suggest that while producers actively seek to promote associations between elements in the end it is the practitioners (those who do) who ultimately make such integrations happen. Although these roles are different, both are involved in the (re)production of practice.[194]

Shove especially draws our attention to how potential unsustainable practices are caused by the normalization of meanings of, for example, comfort. Air-conditioning technologies enabled people to control humidity, temperature and ventilation and Shove maintains that they had a key role in standardizing expectations about

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[190] In the following chapter on local contexts, these categories of elements in a normal practice will be explained. Routine cognitive aspects are explained above, in terms of working with the solutions and co-evolution of design solutions with the design problem.
[191] Reckwitz, *Toward a Theory of Social Practices : A Development in Culturalist Theorizing*, 255.
[192] Chappells and Shove, *Debating the Future of Comfort: Environmental Sustainability, Energy Consumption and the Indoor Environment*, 32-40.; Pantzar and Shove, *Understanding Innovation in Practice: A Discussion of the Production and Re-Production of Nordic Walking*, 447-461.
[193] Kimbell, *Rethinking Design Thinking: Part II*, 129-148.
[194] Pantzar and Shove, *Understanding Innovation in Practice: A Discussion of the Production and Re-Production of Nordic Walking*, 449.

comfort. It is therefore crucial to conceive buildings that would become elements of sustainable practices. To this end, this study analyzes the role of BEATs not only in altering the practices of architects, but also the practices of occupants.

4.4.2.1 THE ROLE OF DESIGNERS IN PROJECT BRIEFING

SPT focus on the designers' routines in designing. However in order to delve into routines, there are a number of key issues that the study should borrow from researchers on design thinking. It is maintained that one of the major abilities of designers is to "frame problematic situation in new and interesting ways."[195] In design context, framing is defined as a creative step which allows original solutions to be produced. Framing is seen to be one of the key aspects for designers who bring a 'fresh perspective' to the design situation. The notion of frame in design theory largely bases on Donald Schön's work on reflective practice, which is explained above. Paton and Dorst state that:

> In Schön's view of framing, a certain perception of a problematic situation (a 'view') is combined with the adoption of a terminology and a way of reasoning that allows the 'framer' to develop a set of possible actions. This is in line with cognitivist definitions of frames and framing and doesn't acknowledge how value-laden frames can be.[196]

With reference to a situated, practice-based view, it is possible to determine how value-laden frames are active during briefing. During briefing, both client and designer hold their own frame for the situation. While the client is usually inclined to frame the situation, based on the expert knowledge, which also includes what is termed as 'desiderata' and previously encountered design solutions, the designer or designers (architects) hold another frame stemming from their routine experience, that is, their guiding principles. Paton and Dorts define the aim of briefing as reframing "both the client's and designer's preliminary appreciation of the situation in order to create an actionable view of the project for both parties."[197] This process is therefore essential in determining the journey of the project by including decisions on "a desired end state or goal; prioritisation and selection of relevant features; problem scope, solution scope and resource constraints; and projected value."[198] Researches put forth that designers have an essential role in shifting clients' frame over the design problem (which is usually maintained to be based on a problem-solving approach) to one that allows for introducing new visions. Paton and Dorts state that one of way attaining this is through abstraction, which would highlight the uncertainty about a future context by "steering briefing conversations away from specific outcomes to an exploration of deeper situational values."[199] Their study reveals three ways in which the designer 'destructured' the clients' frames: The use of metaphor and analogy, contextual engagement and conjecture.

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[195] Bec Paton and Kees Dorst, "Briefing and Reframing: A Situated Practice," *Design Studies* 32, no. 6 (2011), 573.
[196] Ibid., 574.
[197] Ibid., 575.
[198] Ibid., 575.
[199] Ibid., 580.

This aspect alludes to the role of designers in changing and possibly extending the taste regimes of client and user groups. Paton and Dorts relate their study to Cameron Tonkinwise's research on the role of structures, or as he referred to Bourdieu *habitus*, in shaping the taste regimes.[200] The study will explain the importance of structures not only on taste regimes, but also on the formation of designerly ways of doing practice below. Therefore contextual engagement with new materials and technologies, cultural events, and style movements is explained to be one of the main drivers for extending the frames of designers, and by consequence their capacity to reframe design briefing. To this end, Paton and Dorts state that "situated framing and reframing practices during briefing are clearly cultivated areas of expertise for designers."[201] Actually strategies to shift the clients' expectations are not part of education curriculum, and it is seen that this ability develops over experiences and depends on the engagement of designers in new developments in the field. These determinations may be crucial in cultivating an environmental approach in clients that would foster innovative projects. There are crucial insights to be gained from this discussion for this study. Practices conceived as routine in designing, as will be explained below, are situated activities and are structured not only by these routines, but by also structures that causes these routine activities. Therefore the engagement of designers in new developments might redirect the designer's capital. By so doing, they might shift the client as well.

4.5 MLP AND SPT: ANALYSIS OF THE REGIME AND PRACTICES WITH TOOLS

Analyzing case studies based on SPT would enable the study to include the influences of multiple interests, thus backgrounds or ways of doings, of various design professionals, such as electrical, mechanical engineers, or landscape designers. Furthermore, BREEAM or LEED represent another structure put onto practice; they represent new meanings and provide standards or methodologies for estimating environmental issues. Then SPT can explain the formation process of a new practice, resulting from new actions taken by design professionals. However, the analysis on the horizontal level with SPT does not enable this study to explain how the use of BEATs possibly enhance sustainability transitions in the built environment, as well as transitions in sustainable lifestyles, which might be constrained by existing regimes.

By employing the SPT and the MLP perspectives to analysis, in a manner that is enriched by discussions on niche-regime interactions, this approach is helpful in that it forces the study to investigate the mechanisms by which particular structures, or regimes, as Schweber and Harty call macro-level factors, impose on everyday practice of designing and constructing.[202] So how the knowledge to construct these socio-technical artifacts is gained and how this knowledge interact with design practices, and how this knowledge triggers possible innovations is at

[200] Cameron Tonkinwise, "A Taste for Practices: Unrepressing Style in Design Thinking," *Design Studies* 32 (2011), 533-545.
[201] Paton and Dorst, *Briefing and Reframing: A Situated Practice*, 585.
[202] Schweber and Harty, *Actors and Objects: A socio-technical Networks Approach to Technology Uptake in the Construction Sector*, 657-674.

the core of this study. Making innovations in our everyday practices, including our architectural practice at a systemic level that fundamentally change how the ways things are done is therefore suggested as a sine qua non for transition to a sustainable future. However, as maintained in this chapter, our worldviews are embedded in the rules governing the deep structures.

Design and construction practices guided by LEED or BREEAM are defined as niche practices in this study. Innovations, and their locus of activity, niche-practices, as introduced in this chapter, are considered as possible, probably preliminary, attempts towards sustainability transition of the whole construction regime. Again it is emphasized that this regime has relationships with a number of supply chains, like energy, science, socio-cultural, transportation, policy (municipalities, spatial planning, legislation), material production (mechanical or electrical systems). Making a transition in the regime of building design and construction is bounded to these regimes, or systems of practices as well, as they share a number of institutional rules (cognitive, regulatory, normative) and practices in these regimes have deep relationships.

In order to understand niche-multi regime interactions within this field, the study refers to a heuristic tool developed by Hargreaves *et al.* based on an analytical framework originally developed by Shove in the context of practices.[203] In their study, Hargreaves *et al.* use this tool to explain two case studies, one from an organic market company, and second a discussion group aiming to bring forth sustainable practices. Hargreaves *et al.* states that this framework underscores that understanding transitions requires three strands of investigations:

> i) transitions in regimes as they occur through interactions between niches,regimes and landscapes –The vertical circle;
> ii) transitions in practices as they occur through change and continuity in different circuits of reproduction – the horizontal circle; and
> iii) how regimes and practices interconnect with and bump into one another in the course of transitions processes – the points of intersection.[204]

However their framework does not include the interactions between different niches practices, for example renewable energy production or electricity cars. In this sense, this lack does not seem to enable this study to forecast transitions in regimes, because based on MLP and SPT new elements might not be found in the regime level; they might be taken from niches.

By considering these lacks, this study adapts Hargreaves *et al.* framework into the socio-technical system of built environment. Herein regimes are not conceived only as practices, including design and construction practices. Especially in the case of transportation, infrastructure is a highly important element in constraining the application of new systems of practices. Following this framework, it might be possible to see how the practices with BEATs are possibly constrained by regime practices, as they cut across various regimes along the process. In the niche level,

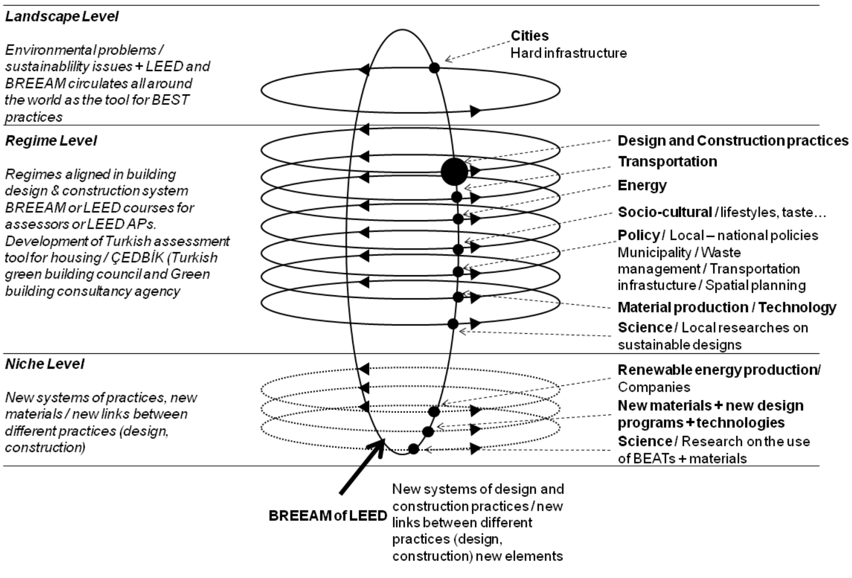
[203] Elizabeth Shove, *Comfort, Cleanliness and Convenience: The Social Organization of Normality* (Oxford: Berg, 2003), 192-193.
[204] Hargreaves, Longhurst and Seyfang, *Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory*, 1-25.

there might be also new niche practices under various regimes, in terms of new electricity cars, renewable energy, etc. Moreover this framework shows how the certified buildings possibly contribute to the regimes as designs become elements of practices, as designs-in-practices. In order to lay down the interaction of design and construction process into these regimes, the study summarizes the basic requirements of green or sustainable building designs.

The preceding chapter revealed various features what might mean a sustainable building, what might be its features; however the study didn't list down the basic possible requirements for building these projects. Integrated design process including suppliers, professionals and users is seen to be one of the main features of attaining sustainability. Besides it demands new technical and social elements, which are given in the following list:

- New materials (transparent insulation, renewable insulation material) and new technologies (controlled ventilation with heat recovery, etc.) This requires new sectors.
- Mutual adjustment and interaction of developers, architects, service providers, construction companies, including sub-contractors and ecologists.
- Assessment of performances and its integration into the design process
- Integration and stabilization of new actors (e.g. producers of renewable insulation material; use of integrative planning methods and processes, development of a market for special services related to sustainable construction).
- New competencies and a new understanding of sustainable construction by actors involved.[205]

Actually all these features indicate that design and construction design processes with BEATs would touch into these features as represented in Fig. 4-12.



[205] Harald Rohracher, "Managing the Technological Transition to Sustainable Construction of Buildings: A Socio-Technical Perspective," *Technology Analysis & Strategic Management* 13, no. 1 (2001), 143.

Fig. 4-12: Practices with BREEAM or LEED: Intersecting regimes or practices

The second framework developed in line with MLP represents the horizontal circulation of practices or regimes and in niche practices with BEATs. It lays down how possible transitions can be foreseen in the future (Fig. 4-13).

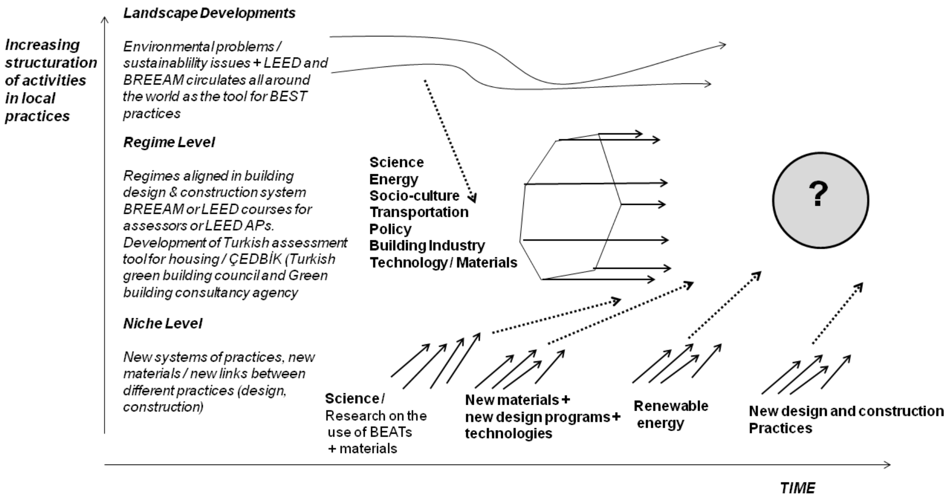


Fig. 4-13: Possible transition pathways in regimes and practices

Specific questions that must be addressed in the discussion of case studies:

1. How do LEED or BREEAM integrate elements of sustainable practices into the evaluation tool?[206]
2. Is it possible to observe certain circumstances in which regimes do not allow certain design decisions?
3. Is it possible to observe certain circumstances in which niche practices contribute to the regime?
4. As these tools are not developed for Turkey, is it possible to observe that due to the interaction between regimes and these practices with BEATs, these tools hinder the possibility of attaining alternative, local solutions?
5. This study looks only to the last 4 years, dating back to the first building certified in Turkey (2008). Is it possible to foresee any transition in regimes or in other words in practices owing to BEATs?
6. Is it possible to state that LEED or BREEAM practices are really niche activities only because their use is very low? Or, is it possible to state that LEED or BREEAM practices are radical innovations in practices?
7. Is it possible to observe that learning in practices disseminates into regime actors in terms of “social learning” or does learning remain only as “actor learning”; that is, do only those who take part in the practices learn and restructure themselves?
8. What would be the real contribution of these tools in enabling system innovation?

[206] This framework indicates that a number of regimes or other niches are influenced owing to the practices with BEATs.

4.6 SUMMARY

Addressing the challenge of sustainability is explained to lie in changing worldviews. However escaping from the cognitive rules triggered by the worldview or in other words, working, producing and thinking in a new paradigm requires someone or a group to stay in a niche protected from the structuring effects of overarching rules of the systems. Therefore to challenge the outdated worldview, people have to escape from the prevalent discourses or barriers to thinking.

BEATs have been explained to have been prepared according to a mechanistic worldview in this study. However in regard to their appeal in the building and construction field in Turkey, these tools are considered as the authoritative tool leading to 'sustainable' or better 'green' projects.[207] The premise of studying design practices with BEATs relies in its potential to identify local specific sources of path dependence and thereby reveal their consequences in design decisions. Moreover, how a new practice interacts with these circumstances barriers and possibly challenges them is essential for the conception of sustainable patterns of action, not only in the development of new tools but also in the implementation of roadmaps for sustainable communities. Furthemore, in line with Brown and Vergragt we might presume that these "highly visible "green buildings" may become monuments to short-lived fashion or a prestige-seeking behavior by some well financed enterprises."[208] Consequently the overarching socio-technical regimes effective on the building design and construction sector might remain unchanged. As outlined in Chapter 2, if LEED and BREEAM are used by developers seeking public recognition, "the achievements of LEED standards in increasing performance of buildings would level off at a modest gain level, and the standard might become an impediment to rather than a starting point for more radical future innovations."[209]

In regard to the contested nature of the concept of sustainability, transitions might follow the one which exerts more power on discourses. Probably we might argue that this is the case in the adoption of BEATs as the ultimate tool for directing the transition. Given that the current regime is more or less shaped with a mechanistic worldview, it is essential to first reveal whether there is any possible innovation owing to BEATs. It will then be possible to talk about a ground-breaking improvement owing to BEATs. To this end, Chapter 5 will overlay the building design and construction regime and therefore practices in Turkey. The chapter will also examine the dissemination and appreciation of these tools based on the results of a survey questionnaire. Chapter 6 aims at answering the questions developed for SPT analysis of design process for architects, and the questions developed through the conjunction of MLP and SPT based on case study projects. In regard to the dissemination of these assessment tools, the study will dwell upon possible shifts in regimes and practices in Turkey.

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[207] This determination is based on the literature review on the local context and the survey undertaken by the study, which will explained in the following chapter.
[208] Brown and Vergragt, *Bounded Socio-Technical Experiments as Agents of Systemic Change: The Case of a Zero-Energy Residential Building*, 109.
[209] Ibid., 109.

CHAPTER

5 SUSTAINABILITY IN THE LOCAL CONTEXT

Innovations are explained to stem from shifting worldviews. However in regard to the socio-technical system of building industry, it does not seem to be an easy task to change people's lenses, and probably only through the use of BEATs. To understand the role of BREEAM and LEED in practices, this chapter lays down the current 'co-evolving' socio-technical system in Turkey. This overview, besides enabling the comparison of new or emergent practices with BREEAM or LEED to the old one, brings forth what might be the major barriers that the new practices will encounter. Following this review, in order to discuss the appreciation of these tools by design, construction, and academic professionals, the study shares the results of the survey questionnaire. To reveal the impact of these tools on the discourse of sustainable buildings, this chapter analyzes the definition of sustainable buildings given by these professionals.

Be it in a product or in a process, innovations can only be understood inside the context of its creation and implementation. Revealing the context and the conditions in which BEATs are inserted is crucial for understanding how the new practice with BEATs deviates from normal practice, and how this new practice influences the overarching regimes forming the socio-technical system of built environment in a country as well as possible innovation tracks that might be followed in the future. The discussion in this chapter current focuses especially on the prevailing characteristics of both design and construction sides of the built environment in Turkey to indicate the ongoing stabilized routines in the context. While the focus of this study is on the interaction of BEATs with the design side, it is necessary to acknowledge the construction side as well. The construction side, besides structuring the design side, defines another overarching regime that enables or precludes design alternatives. Furthermore, this chapter extends the discussion to include certain normative rules stemming from the alignment of socio-cultural regimes and the building designs.

5.1 SOCIO-TECHNICAL SYSTEM OF BUILT ENVIRONMENT IN TURKEY

Architectural design and construction processes have some particular characteristics that make them unique compared to other industries. The construction sector, in contrast to functionally organized firms, is built upon project-based firms, which gather around projects and the production of one-off –or at least highly customized– products and services."[1] These teams "operate in diffuse coalitions of companies along the supplier-customer chain,"[2] including the design teams composed of the architectural group, engineers, and for the present study, the green building consultants. So innovation activities are performed simultaneously by distributed agents in these firms or teams, and it is shaped by project requirements. This means innovation may be co-created in a multi-party environment and shaped by project requirements.

5.1.1 THE ARCHITECTURAL DESIGN PROCESS IN TURKEY

In order to understand the context into which BEATs are immersed, it is essential to understand the architectural practice ethos, that is, its social, economic, political, and social structure. Discussing in length the local practice is beyond the scope of this study, but there are several insights to be gained from how projects are undertaken in the routine practices in architectural design offices. Just to give an idea about the normal practice in Turkey, this chapter aims to share a number of key aspects.

5.1.1.1 ARCHITECTURAL DESIGN OFFICES

Architects are seen to be primary persons that keep in touch with clients, either private companies or state. Architectural projects of state buildings are obtained by a tendering process. For example, the Ministry of Health announces a tender for a hospital building of 200 beds. Tender documents include building program and details about the site. Required materials are normally indicated in building regulations, if there is no specific requirement for a project. Architectural design offices apply to tenders and the office which bids for the lower price gains the tender and starts the design process. In Turkey, architectural design offices make the budget agreements with the engineering offices for the project.

During the normal practice, architects start designing the building, with a number of phone calls to ask questions to the civil engineers or mechanical engineers for gaining very brief information about certain dimensions of structures or the location of HVAC systems. Almost nearly at the end of conceptual design, the project is sent to the civil engineer and the mechanical engineer. After completing the required revisions, if it is a state building, architects submit the conceptual design to T.C. Başbakanlık Toplu Konut İdaresi Başkanlığı (Republic of Turkey, Housing

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[1] Beerepoot and Beerepoot, *Government Regulation as an Impetus for Innovation: Evidence from Energy Performance Regulation in the Dutch Residential Building Sector*, 4814.
[2] Ibid., 4814.

Development Administration of Turkey) that opens the tendering process for construction. As the tendering is based on conceptual design, architects try to detail the projects as if they are drawing the construction drawings of buildings, because according to regulations, changing technical drawings require the approval of regulatory commissions of both the ministry and TOKİ. However the design phase is short[3] and the design cost is very low, which hampers the coordination among design professionals.[4] Firms that win the tendering of construction, commission either the same architectural design office or another one to obtain the technical drawings of the projects. In fact, during the construction phase, it is maintained that usually contractors change projects, as the control mechanism does not function very well. If the project belongs to a private company, the above mentioned process until the conceptual design is almost the same; only the technical drawings are also produced by the same architectural design office.

Another process through which architectural projects are obtained is through architectural design competitions opened by public governments, usually for municipality buildings, airports, cultural centers, and bus terminals.[5] The time allocated for the competition usually ranges from two months to three months. Therefore considering the work load of design professionals in their professional projects, this time range is usually criticized in Turkey for not enabling to further develop projects, as the rendering and the drawing of projects requires considerable time. In these competitions, it is obligatory to submit project reports from mechanical, electrical, civil engineers, and, for a number of competitions, landscape architects. The administrator of the project competition signs a contract for the project with the design team of first prize winner project. Based on the personal experience of the author, it is not possible to speak of collaboration between architects and engineers in the design process. Usually, the architects send the document to the engineers who write a generic report about the suitability of the project decisions for their discipline.

The main problem in the context of Turkey is seen to be the lack of integrated design process between the architects and the engineers. This problem in the context is explained by Selçuk Avcı, one of the architects of the case study projects, in an interview as follows:

> For attaining sustainability in architecture, we, as architects, cannot go alone. Engineers and landscape designers, by adopting this approach, should accompany us. The leader of this group is always the architect, as s/he is the first one to make first sketches. However the process to which we are accustomed is going in this way: “Take this [project], put some shafts, put pipes, check if it is enough to resist earthquake, put some steel and give it back to me.” Engineers are not considered as creative people. This belief is not held by all the architects; in Turkey there have emerged a number of architects who have internalized this approach […] Nevertheless the

[3] For example for a hospital of 300 beds, the project delivery time is only 90 days.

[4] Turhan Kayasü et al., "Yuvarlak Masa, Sağlık Yapıları," *Serbest Mimar*, no. 9 (2012), 66-83.

[5] There are also invited design competitions opened by private companies; however details about these competitions are not made public.

> remaining 99% are not like this. The number of those good architects is just a few, probably not more than 10. This percentage should be reversed.[6]

Therefore in a routine process, it is maintained by Avcı that engineers cannot read through the architectural program in terms of the relationships between spaces, and requirements.[7] As the recruitment of engineers is foreseen after the conceptual design phase, they only add comments that support the design decisions taken by architects and they pass on to the technical design phase. Moreover, when a project owner asks for the offerings of project design from engineers, as the engineers assume that they will participate to the design after the conceptual design phase, this also reflects in their offerings, which remains very low compared to their European colleagues. In fact, Avcı underlines that when the engineers participate to the conceptual design phase, they do not spare time for this phase, as they presume that they will not have an influence on project design. Therefore, the knowledge, meanings and materials recruited in design practices pertaining to the conceptual design phase are seen to be depend on architects' practices. As maintained in Chapter 4, it is true that regulative and normative rules impact on the recruitment of these elements, in normal practice; however it is the architect who repeats or challenges these rules at each practice-as-performance,

There is another type of routine in design practice in Turkey, and in recent years it has probably become the most controversial practice in the context. TOKİ, as the housing development organization, is one of the main regimes in the social housing construction in Turkey. For social housings, the organization has developed certain type apartment blocks, like type A, B, C, which are then implemented in whatever context. It is seen that the only parameter that changes over different regions is the thickness of insulation materials. The author of this study has worked in an architectural design office which mainly carries out the technical design phase of this type of projects, and actually we might be able to see a conceptual design phase in this practice. Just give an idea about the results of this practice, the study shares certain building projects built in various regions from Turkey.


Fig. 5-1: A housing development in Bursa (Left)
Fig. 5-2: A housing development in Ankara (Right)

Over the last few years in Turkey, there is another type of stakeholder: real estate consultants, included in the design processes of architectural design processes,

[6] Avcı cited in Çiğdem Yılmazer, Sürdürülebilirlik anlayışı kalem daha kağıda değmeden ortaya konulmalı, Interview with Selçuk Avcı, 2011.
[7] Avcı cited in Ibid.

especially for shopping mall, new residential, and office buildings. It is seen that one of the major of role of the consultants is to make market research and land analysis to direct the developers and investors on building in delineating which type of project, in terms of function, requirements, and equipments would make sense in a certain project site. The consultants are seen to have a big incentive in delineating the architectural program. Therefore recruitment of this knowledge into designing appears to have role in changing routines in the formation of architectural program, which used to be the role of owners and architects in the past. Therefore their role should be analyzed with respect to the prospects of sustainability.

The above overview shows that, due to the regime constraints, currently architectural design processes in Turkey have to be carried very fast. It is also maintained by people working in green building consultancy offices that this fast process has become one of the main reasons why LEED has become the leading tool used to assess projects in Turkey.

5.1.2 COMPLEXITY IN CONSTRUCTION PROCESSES

Project-based work, interdependencies among various subcontractors, the centrality of communication, and the way power is distributed among firms are seen to be the main features of the construction industry. Complexity in construction is explained to be the main driver of the behavior of the firms in the construction industry. There are a number of sources of this complexity: "[R]esources employed, the environment in which construction takes place, the level of scientific knowledge required, and the number and interaction of different parts of the workflow."[8] Gidado divides the sources of complexity in the construction sector into two categories. The first one is related with the 'uncertainty' in handling diverse components needed for construction and the uncertainty about the environment in which the construction takes place. The second one originates from the 'interdependence' among tasks performed by diverse parties working on the same project and the management of a workflow. The following table is prepared based on the research of Dubois and Gadde, which reveals the causes of these complexities:

Tab. 5-1: Table explaining the two categories of complexities in construction sector

Uncertainty	Interdependence
1) Management is unfamiliar with local resources and the local environment (2) Lack of complete specification for the activities at the construction site (3) Lack of uniformity of materials, work, and teams with regard to place and time (every project is unique) (4) Unpredictability of the environment.[9]	(1) the number of technologies and the interdependence among them; (2) the rigidity of sequence between the various main operations (3) the overlap of stages or elements of construction.

[8] Gidado cited in Anna Dubois and Lars-Erik Gadde, "The Construction Industry as a Loosely Coupled System: Implications for Productivity and Innovation," *Construction Management and Economics* 20, no. 7 (2002), 622.
[9] Ibid., 622.

Actually these conditions stem from the organization of the sector. There are various stakeholders in one project: Material producers, contractors, subcontracts or production firms… To cope with this complex environment, it is observed that the construction sector has developed a certain kind of collective practice which relies mainly "on coordination of specialized and differentiated task at the site-level."[10] It is maintained that the emphasis on site-level activities brings forth two central characteristics of construction. First, by focusing on individual projects, decision-making and financial control is decentralized,[11] that is, the contractor distributes the construction of parts to a number of firms, or sub-contracting firms. Furthermore, if the managers of the constructor are unfamiliar with local resources and environment, they rely on localized knowledge. Second, there are various local adjustments at the construction site. These adjustments are actually a response to the remaining three uncertainty factors. Problems are mainly solved by sub-contractors or material suppliers through spontaneous meetings on site. Even after the compilation of design project which includes material details, in some cases contractors are led by marketing experts of material companies to choose new materials, and new construction details are updated based on the knowledge of subcontracting companies. Third, the focus on individual projects favors "a narrow perspective, both in time and scope."[12] Competitive tendering puts emphasis on efficiency, so choices mainly rely on economical ones. New customized, or in other words adapted, solutions are not possible within the current tendering process.

Dubois and Gadde refer to this nature of the sector as a system of 'tight and loose couplings.'[13] While in the individual project work the couplings are tight, in the permanent network they are loose. Firms, such as material producers, suppliers and constructors, work independently along the network; however they meet for projects. Usually, beyond the limits of individual projects, inter-firm adaptation is rare, and "firms tend to rely on short-term market-based exchange."[14] So there is no guarantee that further collaboration among the team will continue. Surprisingly, regardless of just a few firm-specific adaptations, it is still possible to sustain tight couplings in individual projects. This is explained by Dubois and Gadde as a result of a certain "collective adaptation" among the firms. They contend that standardized components and systems are formed out of "collective efforts among material producers, contractors and the governmental authorities who prescribe norms and other conditions."[15] This means not only norms but also values and knowledge are socially constructed along the years. Based on the study of Brown and Duguid, Dubois and Gadde explain this feature with reference to SPT:

> Collective adaptations are formed in what can be identified as 'a community of practice.'[16]

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[10] Ibid., 622.
[11] Ibid., 622.
[12] Ibid., 624.
[13] Ibid.
[14] Ibid., 626.
[15] Ibid., 626.
[16] Ibid., 626.

Knowledge pertaining to the field is shared collectively. There is a certain kind of common practice, which promotes collective knowledge, shared meaning, and sense-making and distributed understanding. This aspect actually reduces uncertainty and serves “as an informal coordination mechanism in loosely coupled systems.”[17] Dubois and Gadde actually miss one point in this explanation that Brown and Duguid developed in their research: The scale of practice. To further reflect upon the spreading of know-how, Brown and Duguid foresee benefit in extending the boundaries of each practice and argue that:

> Reflecting what binds these networks together and enables knowledge to flow within them, we call these extended epistemic networks ‘‘networks of practice.’’ Practice creates the common substrate. With the term network, we […] want to suggest that relations among network members are significantly looser than those within a community of practice. As Strauss indicates, and unlike in communities of practice, most of the people within such a network will never know, know of, or come across one another. And yet they are capable of sharing a great deal of knowledge.[18]

Hence know-how or what might be also called here tacit knowledge is distributed along the sector.

5.1.2.1 DESIGN AND CONSTRUCTION WORKS ARE PROJECT-BASED

The temporary nature of the project leads to several consequences that impede innovation. First, learning cannot be promoted. The collaboration among team members creates a common ground for sharing the knowledge and experiences of professionals gained over the past projects. Learning through this common ground is explained to require a slow process, which would be only attained at an individual, rather than industrial level.[19] However time limitations obstruct this type of individual learning. Even though there are several tight couplings especially between the design team members, learning requires long-term relationships and adaptation beyond individual projects.[20] Second, especially in construction sites, a lot of creative problems solutions are seen to be generated. However, loose couplings impede the diffusion of these creative solutions.[21] More importantly, in decentralized structures intervening in localized decision-making –and hence innovation– is difficult.

Third, Dubois and Gadde foresee benefit in the strong community of practice and they identify this aspect “as a means of enhancing productivity and efficiency, because it allowed for tight project couplings in spite of the loose couplings in the permanent network.”[22] There are however potential contributions of loose couplings to the complexity in operations. For example loose couplings enable responding to localized adaptation “where any one element can adjust to and

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[17] Ibid., 626.
[18] John Seely Brown and Paul Duguid, "Knowledge and Organization: A Social-Practice Perspective," *Organization Sciences* 12, no. 2 (2001), 202.
[19] Dubois and Gadde, *The Construction Industry as a Loosely Coupled System: Implications for Productivity and Innovation*, 628.
[20] Ibid., 629.
[21] Ibid., 629.
[22] Ibid.

modify a local unique contingency without affecting the whole system."[23] And the adaptation would bring relatively economical and substantial solutions. Actually this defines somehow a sensitive mechanism, which gives a quick response against little changes in the environment, thus enables a greater number of mutations and novel solutions. Besides, actors have the potential to make self-determination. It is argued by Dubois and Gadde that

> loosely coupled systems preserve many independent sensing elements and therefore know their environments better than is true for more tightly coupled systems, which have fewer externally constrained, independent elements.[24]

By consequence, this type of couplings helps the firms to preserve their identities, uniqueness, and separateness. By doing so this coupling would foster variety or what this study termed diversity in practices, which would be helpful for resilience of the whole system. In this case, the whole system, or as referred to in this study the regime, might continue unchanged. However, this aspect might not be as beneficial as thought for two reasons. First, the diffusions of possible advantageous mutations (this is the situated knowledge that have generated them) might be lost in the system, as it does not diffuse in the network. Moreover the very structure which allows these novel solutions might also prevent their diffusion. Actually this determination is at the core of this study, because if the knowledge generated by the help of BEATs does not diffuse in the regime, and vice versa, if these solutions do not fit into the regime, this would obstruct their further use in future. As for the second reason, Dubois and Gadde state that:

> The community of practice stabilizes conditions that promote short term productivity. However, the same conditions hamper innovation because they tend to make firms similar and independent. This is a problem where learning is concerned, because heterogeneity and interdependence are greater spurs to collaborative action than homogeneity and discipline.[25]

5.1.2.2 INTER-ORGANIZATIONAL COLLABORATION

A diverse range of firms and a wide range of skills and specialisms –architectural and design practices, general contractors, specialized subcontractors, fabricators, manufacturers, and suppliers– even geographically apart firms or people, are working interpedently and they have to be coordinated.[26] Thus innovation is not located in the limits of one firm. The complexity therefore lies in establishing a workflow that brings the different parts to work together.[27] The power is distributed amongst collaborating organizations.

5.1.2.3 FINANCIAL ASPECTS

In the literature, it is maintained that within projects in need of complex inter-organizational collaboration, the contractors act as a mediator who "plays a key

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[23] Ibid., 623.
[24] Ibid.
[25] Ibid., 629.
[26] Harty, *Innovation in Construction: A Sociology of Technology Approach*, 513.
[27] Dubois and Gadde, *The Construction Industry as a Loosely Coupled System: Implications for Productivity and Innovation*, 622.

role in the construction value chain when it comes to adopting innovations."[28] It is usually the contractor or developer "who has the contacts with both the institutions developing new products (materials and components suppliers, developers of energy appliances, specialist consultants) and the ones that need to adopt these innovations (clients, regulators and professional institutions)." The financial organization of the sector influences innovation capability. It is maintained that:

> The practice of awarding contracts based on the lowest cost tender is likely to act as a constraint on innovation, since it gives contractors very little scope to change design specifications and introduce innovations. Also, it is quite common for contractors to have relatively little fixed capital, since they do not own any significant assets other than buildings under construction and, in some cases, land.[29]

Each project is actually a new unique challenge for innovation, but "there are hardly any economies of scale" for the investors or contractors to see a reason for investing in innovation.[30] Probably the adoption of BEATs as part of an economical return to owners could be a reason for investing in innovation.

5.1.2.4 GOVERNMENT REGULATIONS

There are various government regulations and industry standards (which will be referred as regulative rules later) that constrain innovation in this sector. The existence of joint industry standards is explained to simplify the work.[31] However these standards are prescriptive rather than performance based. Prescriptive standards imply that certain well tested construction solutions are taken into consideration; therefore predetermined technical solutions and work procedures act as a barrier for innovation. However, there is growing literature on the role of performance based standards in fostering the pursuit of innovations in practices. In the Turkish context, especially the normal practice tendering system is based mainly on prescriptive standards instead of performance based standards.

5.1.2.5 SUMMARY OF CENTRAL FUTURES OF CONSTRUCTION

The central features of construction are explained in the following table, along with effects of loose couplings.

Tab. 5-2: Central features of construction and the effects of loose couplings, taken from Dubois and Gadde[32]

Central features of construction	Effects of loose coupling
Focus on single projects Local adjustment Utilization of standardized parts Competitive tendering Market-based exchange Multiple roles	Localized Buffering mechanism Sensing mechanism Generation of variation Self-determination

[28] Beerepoot and Beerepoot, *Government Regulation as an Impetus for Innovation: Evidence from Energy Performance Regulation in the Dutch Residential Building Sector*, 4816.
[29] Ibid., 4816.
[30] Ibid., 4816.
[31] Dubois and Gadde, *The Construction Industry as a Loosely Coupled System: Implications for Productivity and Innovation*, 621-631.
[32] Ibid., 624.

This discussion shows that the way construction firms establish their work pattern puts several obstructs on possible innovations. It is maintained that the complexity of the construction sector influences and shapes a particular kind of community of practice. In fact, regardless of these difficulties, as the projects are always unique, each solution is customized to some extent. As the innovations lie in these processes or in the organization level, they are hidden at the project level for which construction companies do not create new patents.

The study argues that networked knowing is hampered by this practice, due to the division of the construction activities into different subcontractors. In terms of innovation, the literature suggests tighter couplings among firms for the overall performance in construction.[33] In this sense, one of the main rigors of BEATs in such an environment would be to bring loosely coupled people into the same table, because during the construction phase contractors or material suppliers become part of project meetings as well.

5.1.3 NORMATIVE RULES: SOCIO-CULTURAL REGIME RELEVANT TO THE BUILDING INDUSTRY

According to the analytic framework developed based on SPT, the study has to examine especially the material and formal expectations forming the normative rules. Actually these are taste regimes. For better explaining the importance of this discussion, the study refers to Gino Zucchi's installation, called Copycat, in 13th Venice Architecture Biennale 2012. He says: "Man-made objects are not single formal entities; they have always shown different orders of similarities among each other."[34] His installation project and his article remind us how actually sharing a "common ground" does not only mean to share a spoken language but also to share formal languages. This study shares his thoughts about the life of forms:

> Refusing established codes –but avoiding the arbitrariness of subjectivity– modernism has tried to find a scientific approach to design […] In this simplified view, the formal differences between things can only be derived from the differences in living conditions, climates, technologies […] this point of view denies any autonomous life of forms […] But in most of the things we feel comfortable with, this likeness seem to be the product of customs rather than laws; of habits rather than procedures […] The variation of traits among families of objects could be seen as the result of two contrasting forces: the will to innovate and affirm one's own individuality and the equally natural tendency to emulate, exploit and replicate acquired equilibrium states.[35]

In this sense, the current evolving socio-cultural regime in Turkey has certain attached similarities, in other words meanings, to these forms.

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[33] Ibid., 627.
[34] Zucchi, *Sharing Forms: 'Urbanity' as Emulation and Habit*, 113.
[35] Ibid., 114.

Fig. 5-3: Picture of Zucchi's installation showing buildings from Milan (Left)[36]
Fig. 5-4: Picture of people wearing similar clothing (Right) [37]

Therefore, we should look for materiality of buildings in Turkey, as this might indicate meanings not only for designers, but also for developers or owners, as their predilection for certain requirements might not coincide with aspects of sustainability. For example, in Turkey we might speak of the materiality of office buildings. The buildings shown below are located on one of the main avenues in Ankara. Building (1) is the headquarters of a bank built in the early 1990s. Building (2) was constructed in 2004. Buildings (3-4-6-7-8-9) were constructed in between 2009-2011. There is a certain typology growing in terms of office buildings. These examples also show how regulatory rules, like legislations dictate a certain kind of typology. According to the legislation, you cannot build more than 5 floors high with respect to the location of building from the main road, so the height is free.

Fig. 5-5: A number of buildings in Ankara. From left to right (1-2-3-4-5-6-7). Building (5) is the one in brown white color.[38]

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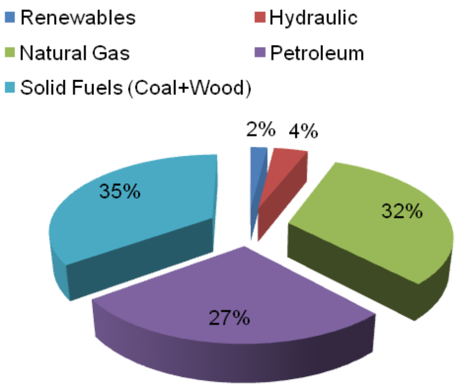
[36] Picture taken by the author
[37] Picture taken by the author
[38] Picture taken from http://wowturkey.com/forum/viewtopic.php?p=2844935 (accessed December 17, 2012).

Another cultural aspect that we have to consider is the square meters of houses. Based on the Turkish Statistical Institute Building Permits Statics, average apartments unit area in 2011 is 144.8 m^2 (From 2002 to 2011 this average ranges from 158,7 m^2-144,8 m^2). These numbers actually indicate the demand side of expectations.

5.1.4 ENERGY REGIME

Herein the study will briefly give administrative, demographic, and economic information about Turkey. The territory of Turkey is subdivided into 81 cities for administrative purposes, and into 7 regions Marmara, Aegean, Black Sea, Central Anatolia, Eastern Anatolia, South-eastern Anatolia and the Mediterranean. However these regions do not have an administrative structure. According to Turkish Statistical Institute (TSI), as of December 2012, the population of Turkey is 75.627.384 and nearly 77% of this population lives in cities and towns. The distribution of the population according to age group is: 15–64 age group 67,4%; the 0–14 age group 25.3%; over 65 years 7.3%. Even though the population growth is decreasing in Turkey (as of 2012 nearly 1,2), it is higher compared to the mean average of EU countries (as of 2012 nearly 0,3).[39] Compared to the difference between the years 2010 and 2011, the Turkish economy has grown 5,2% in terms of GDP.

This section intends to inform the reader on the energy demand of buildings in Turkey and demonstrates the share of primary energy sources.



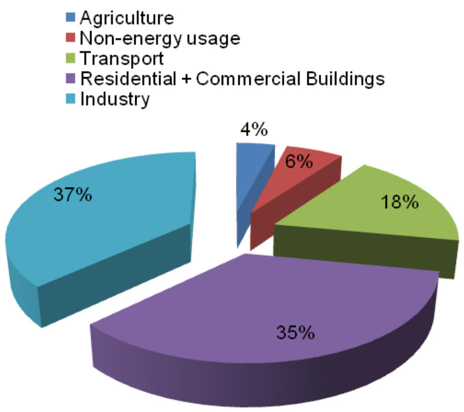


Fig. 5-6: Total energy consumption by primary energy resources, Turkey (2012) (Left)[40]
Fig. 5-7: Total energy consumption by sectors (2012) (Right)[41]

Regarding the share of primary energy resources, it is seen that Turkey relies heavily on fossil fuels with 93%, and buildings, including commercial and residential buildings, are in the second place in terms of total energy consumption.

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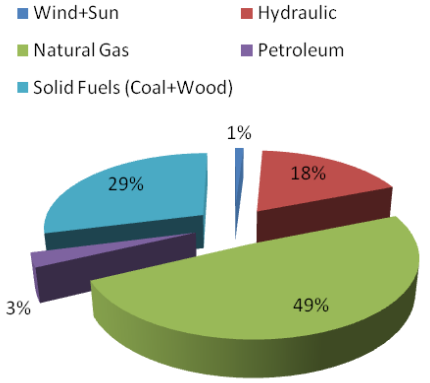
[39] Özden Özkan Çayırlı et al., eds., *Guidebook: Financing Energy Efficiency in Buildings Future Perspectives*, IMSAD, Association of Turkish Building Material Producers, 2012), 75.
[40] Ibid., 77.
[41] Ibid., 77.



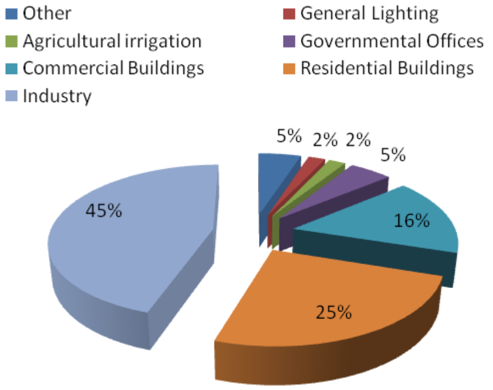


Fig. 5-8: Total electricity consumption by primary energy resources (2012) (Left)[42]
Fig. 5-9: Total electricity consumption by sectors (Right)[43]

Again the electricity production from fossil fuels is 81% in total, and buildings, including residential, governmental and commercial, are seen to be the primary sector in the consumption of electricity with a share of 46%. Based on a research on the potential of energy savings, it is maintained that "for the electricity, residential and commercial buildings have the same potential, whereas for the thermal energy, residential buildings have about twice more saving potentials than the commercial ones."[44] The potential savings are explained in the following table.

Tab. 5-3: Sectorial energy saving potentials[45]

	Energy saving potential, %	
Buildings	Electricity	Thermal
Residential	29	46
Commercial	29	20

5.1.5 MAJOR BARRIERS IN IMPLEMENTING GREEN/SUSTAINABLE BUILDINGS IN TURKEY

The study indicates the major barriers in implementing green/sustainable buildings in Turkey in the following list. These barriers actually become the main of cause of path-dependency in the field of built environment. The following list has been prepared based on the literature review and preliminary interviews with professionals working in the field, and is based mainly on Erten's conference presentation in UNEP-SBCI, 2011[46] and the results of the "EUbuild ENERGY EFFICIENCY EUbuild EE - Financing Energy Efficiency in Buildings within the Frame of EU Regulations and Legal Arrangements" project which is funded by the European Union under the Socio-Economic Partnership (SEP) program.[47] The study will reflect upon the consequences of these barriers through the survey questionnaire results.

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[42] Ibid., 78.
[43] Ibid., 78.
[44] Ibid., 78.
[45] Ibid., 78.
[46] Duygu Erten, "İSTANBUL: The Challenges for Sustainable Buildings in Emerging Economies" (Leverkusen, Germany, May, 2011).
[47] Özkan Çayırlı et al., *Guidebook: Financing Energy Efficiency in Buildings Future Perspectives*

Tab. 5-4: Table explaining the major barriers in implementing green/sustainable buildings in Turkey[48]

GOVERNMENT	• There is no specific incentive for property owners, businesses and financial institutions that may be in the form of tax subsidies for green building, or financial support and investment. • Even though the policies, legislations and laws are getting strict on energy efficiency, they have not yet taken an approach to aspects of sustainability • In terms of rendering new buildings energy efficient, there is a new mandatory certification program called (BEP-TR) - “National Calculation Methodology. However there are major problems stemming from both its calculation and implementation. • Another important factor influencing the development of sustainable built environments depends on the spatial planning and transportation legislations.
PRIVATE SECTOR	• There is a lack of Information regarding green practices, codes and standards and green guidelines • As there is no incentive from the government for these practices, developers may not find it profitable to invest in these types of buildings. • Regarding the discussion on the nature of workflow in the construction sector, sector agents are reluctant to voluntarily adopt new technologies.
HUMAN RESOURCES	• There is no training institute or guideline for people working on site. Several companies issue certifications for workers; however these types of buildings require a number of issues that must be controlled on site and there is no such certification. • There is a lack of experts on LCA, energy modeling, and commissioning.
OWNERS	• Financial incentives put a barrier in owning these types of buildings. • There is still no accurate information about the first cost of these buildings. This leads to assumed cost premiums, which seems to be exaggerated. • Even though there are a number of certified buildings in Turkey, there is a lack of POE of these buildings, so people are not well informed about the benefits of these buildings. This may also well lead to uncertainty about such a property value.
FINANCIAL INSTITUTIONS	Erten summarizes the barriers for the financial institutions as follows: • “High payback period, which leads to low rate of return on

[48] Erten, *İSTANBUL: The Challenges for Sustainable Buildings in Emerging Economies*

	investment; preference for classical investments with quick payback period (especially for retrofitting projects) • High perceived risks and credit risks attached to the client. • Cost-Benefit Analysis is not very easy and evaluation methods are not clear as to the choice of discount rates • Difficult to evaluate energy efficiency projects due to absence of standardized measurements and verification of energy efficiency"[49]

The study refers to the SWOT (strengths, weakness, opportunities, and threats) analysis undertaken by EUBuild. The project details the characteristic of the current energy regime in Turkey. These determinations are especially related with the energy efficiency in the existing building stock.[50] The new mandatory energy performance certification program prepared in line with EU Directives and feed-in tariff system for renewable energy/cogeneration integration to buildings is seen to be one of the main strengths. Furthermore, the competitive construction industry and the increased interest by the national financing institutions offering different types of energy efficiency loans/credits might enable people, especially residential owners, to renovate the existing building stock. However in the regime, it is seen that the major concern is on the energy consumption in the industry sector. As maintained before there is a lack of information and motivation in building owners for investments to reduce energy demand. Furthermore there is a lack of good demonstration of renovation activities in existing buildings to raise awareness in people. One of the main threats concerning energy savings in buildings is explained to be related to the different climatic conditions in Turkey and the diversity in building types. Currently, energy efficient/green buildings are not foreseen as the target. Other than those outlined in the Table 5-4, it is maintained that more concern is put on comfort conditions rather than on energy efficiency. This study argued that this is part of normative rules. The lack of information on average/maximum saving potentials and reference values for different building types are again explained to be a major barrier in adoption. It is seen that this analysis carried out by EUbuild project foresees LEED and BREEAM use as an opportunity for social responsibility and competitiveness.[51]

5.2 BUILDING ENVIRONMENTAL ASSESSMENT TOOLS IN TURKEY

In this section, the study intends to share numerical data about certified buildings.

5.2.1 LEED IN TURKEY

The data for certified buildings is gathered from Green Building Information Gateway and USGBC database. The data indicate the number of buildings as of March 2013.[52]

[49] Ibid.
[50] Özkan Çayırlı et al., *Guidebook: Financing Energy Efficiency in Buildings Future Perspectives*, 80.
[51] Ibid., 80.
[52] Data taken from U.S. Green Building Council, *LEED Project Directory*

Tab. 5-5: Number of buildings across different assessment systems in LEED

LEED System Version	
LEED CI 2.0	2
LEED CS 2.0	4
LEED FOR SCHOOLS v2009	2
LEED NC 2.2	7
LEED-CI Retail v2009	2
LEED-CI v2009	6
LEED-CS v2009	46
LEED-EB:OM v2009	13
LEED-HC v2009	4
LEED-NC Retail v2009	2
LEED-NC v2009	109
LEED-ND v2009 Stage 1	2
TOTAL	199
TOTAL NEW CONSTRUCTION (LEED CS 2., LEED NC 2.2, LEED FOR SCHOOLS v2009, LEED-CS v2009, LEED-NC Retail v2009, LEED-NC v2009	172

Tab. 5-6: Certification of buildings

	All LEED projects			**New Construction**			
	Buildings (Pre-certification)		**Buildings**		**Buildings** (Pre-certification)		**Buildings**
Yes	3	Certified	37	Yes	3	Certified	26
No	192	Registered	162	No	169	Registered	146
	199		199	TOTAL	172		172

Tab. 5-7: Ratings across certified buildings and ratings across certified new construction buildings, LEED

Buildings (ratings)		**Buildings** (Rating, new construction)
Silver	10	3
Gold	25	21
Platinum	2	2

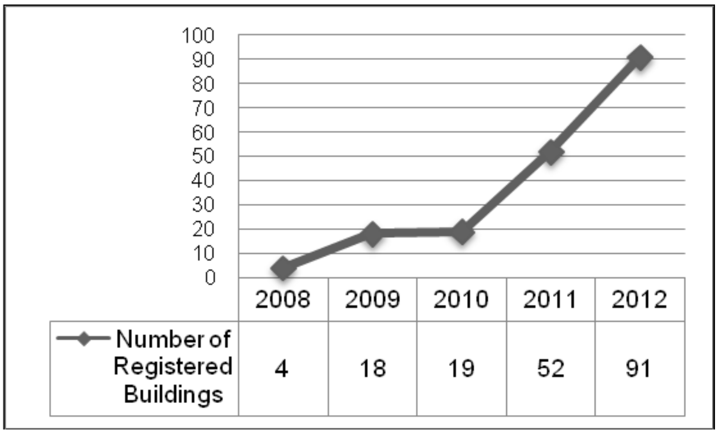


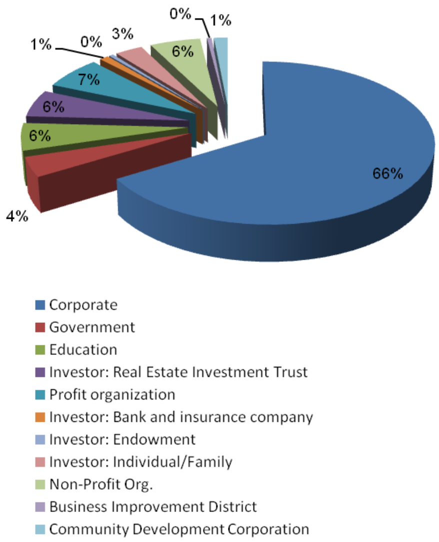
Fig. 5-10: Registered projects across the years (For all LEED systems)

The study observes that as of March 8, 2013, 15 buildings are registered to the LEED Database for certification in 2013 and 14 of them are new constructions and one of them is registered to the LEED Neighborhood Development system.

Tab. 5-8: Number of buildings based on owners (For all LEED systems)

Number of buildings based on owner type	
Business Improvement District	1
Community Development Corporation	3
Corporate: Privately Held	114
Corporate: Publicly Traded	18
Educational: College, Private	4
Educational: College, Public	1
Educational: University, Private	5
Educational: University, Public	1
Government Use: Federal	7
Government Use: Local, City	1
Investor: Bank	1
Investor: Endowment	1
Investor: Individual/Family	6
Investor: Insurance Company	1
Investor: REIT, Publicly traded	6
Investor: REIT,Non-traded	5
Non-Profit (that do not fit into other categories)	10
Non-Profit Org.	1
Profit Org.	12
Profit Org., Other	1
TOTAL	199

Fig. 5-11: Share of building owners (For all LEED systems)



In Figure 5-11, to give an overall distribution of building owners, the study included a number of owner types into the same category. As for building types, it is not possible to retrieve information from the LEED database, because there is a considerable number of buildings that are kept confidential in terms of address or building type (Out of 199 buildings on the database, 66 buildings are kept confidential.). Also the building type information is given for just a few buildings. Therefore the author of this study prepared the Figure 5-12 only for new construction buildings. The figure indicates the share of building functions.

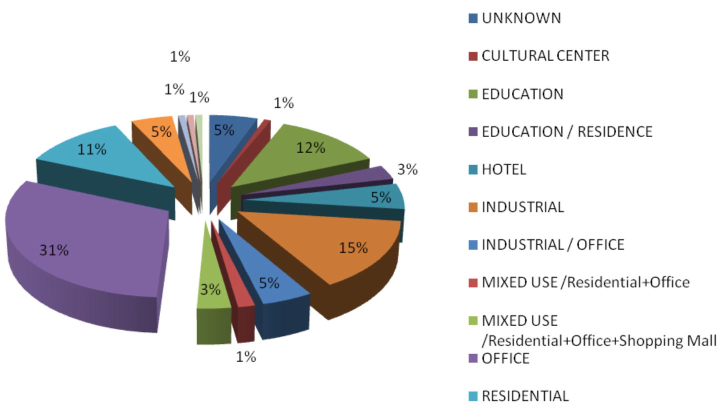


Fig. 5-12: LEED New construction buildings, building functions

5.2.2 BREEAM IN TURKEY

As mentioned in Chapter 3, BREEAM does not make public all the information about certified buildings and its GreenBook Live database does not include information on buildings which are in the certification process. Therefore this study gathered the information about the projects which are certification process from the websites of the green building consultants in Turkey.[53] Another problem stemming from this lack of information is that the study cannot indicate at which level these projects, retrieved from the website of consultants, received certification. Therefore the study only indicates the ratings achieved/sought for these projects.

There are currently 28 projects, which are assessed by BREEAM tool and 22 of them are new constructions.

Tab. 5-9: Number of buildings across different assessment systems in BREEAM

BREEAM Version	
BREEAM Retail (2006)	1
BREEAM International 2009 Europe Commercial: Industrial	2
International 2008 Bespoke	4
International 2008 Europe: Retail	5
International 2008 Europe: Toyota Retail	1
International 2009 Europe Commercial: Offices	5
International 2010 Bespoke	3
In-Use Part 1 and 2	6
TOTAL	27
New Construction TOTAL	21

[53] The study could not retrieve information about the accurate certification system followed by these projects (BREEAM Retail or BREEAM International Bespoke). Therefore the study, based on the certification systems of similar projects, assumed that these projects are following the same systems.

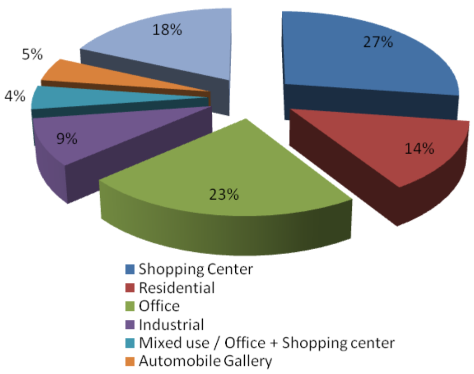
Tab. 5-10: Ratings across certified new construction buildings, BREEAM

Buildings (New construction) new construction)	
Pass	1
Good	8
Very good	17
Excellent	1

Tab. 5-11: BREEAM New construction buildings, building functions

Building Function	
Shopping Center	6
Residential	3
Office	5
Industrial	2
Mixed use / Office + Shopping center	1
Automobile Gallery	1
Education	4
TOTAL	22

Fig. 5-13: BREEAM New construction buildings, building functions



5.3 IMPLICATIONS OF THE BEATS ON THE LOCAL CONTEXT

During the research process, after completing the data collection from case studies and the completion of the literature review on BEATs, the author of this study decided to conduct a survey for three reasons. First, the literature review and the data collected over the case studies gave birth to a number of hypotheses that can potentially be addressed through a survey questionnaire. Second, previous surveys on BEATs[54] conducted in Turkey focused mostly on revealing the problems that occurred in the assessment processes in the Turkish context and the reasons for the adoption of BEATs. Another survey, conducted as part of a Ph.D. research, which is developed to prepare a layout for a local assessment tool, aimed at asking the opinions of experts on the weightings of assessment categories, along with potential new criteria concerning the exigencies of the Turkish context.[55] Second, previous surveys were prepared for people working with assessment tools; however this study considers other professionals working in the field of architecture as potential users of these tools or as agents who might create pressure on the current socio-technical regimes to adopt these tools. Therefore, the study realized a research gap in the field in understanding what design professionals think about these tools. To this end, this study carried out a survey questionnaire and sent it to two groups of design professionals: People who

[54] The author of this study conducted a field search of previously conducted surveys. There are three surveys conducted in Turkey, one as a master's level and two as doctoral theses.

[55] Burcu Yılmaz, "Türkiye Için Yeşil Bina Performans Kriterlerinin Belirlenmesi Ve Yeşil Bina Performansına Yönelik Bütünleşik Tasarım Yönetim Modeli Oluşturulması" (Ph.D., İstanbul Technical University).

worked with BEATs in a project (Group 1); people, who have no prior experience with the tools (Group 2).

While the first and the last page of the survey questions (see Appendix 1) that include general questions about profession, knowledge about BEATs, education level etc., the definition of sustainable building are the same for two groups, the second page is different for each group.[56] For Group 1 the questions are prepared to gain information about a project in which they worked and to obtain their opinion about the pros and cons of these tools. For Group 2, the questions are prepared to access their opinion both on what in a project BEATs might help in the process and on the pros and cons of these tools. The survey was implemented through an online website. The survey questionnaire was sent to the architects, mechanical, electrical and civil engineers who took part in projects with BEATs, to academics working especially in the field of building technologies in departments of architecture, and to the members of the Turkish Green Building Council. The survey online link was also shared with people who might be interested in taking part in this research.

The study decided from the onset not to draw conclusions from quantitative analysis of the survey questions regarding the influence of BEATs in design decisions, as they do not accurately give in-depth information about the process, and, as expected, the response rate was too low to perform a statistical analysis (27 responses from professionals, who took part in practices with BEATs; 106 responses from design professionals without prior experience). Therefore the results are given as the number of responses or as percentages. However conducting this survey enabled asking a number of crucial questions. Therefore it might open new research avenues in the field, while making possible for this study to gain an opinion about the appreciation of these tools.

5.3.1 RESULTS OF THE FIRST GROUP

This section shares the results of survey questionnaire completed by people working in certified projects. As has been noted previously, the intention of the study was to gain an opinion about the influence of the tools both on seminal architectural design decisions, the role of design decisions in term of rendering the building energy efficient, and the problems stemming from the assessment process.

5.3.1.1 RESPONDENTS' CHARACTERISTICS

The personal characteristics of respondents are presented in Table 5-12. The majority of respondents are seen to be architects working in architectural design offices. The study considers that these professionals have a considerable experience to make judgment, as the majority (92%) have more than 5 years or experience. Regarding their sectors and their role in the assessment process, it is

[56] Before sending the surveys to these groups, the study first made a pilot study to understand whether people can understand these questions and time required to fill the survey.

seen that there are respondents working in firms which serve in more than one role to the project design.

Tab. 5-12: Personal characteristics and working experience of respondents

	Number of Respondents
PROFESSION	
Architect	15
Mechanical Engineer	8
Civil Engineer	1
Industrial Engineer	1
Other	2
SECTOR	
Education / Research / Green Building Consultancy	1
Investor Company	2
Architectural Design Office	11
Engineering Office	2
Green Building Consulting Firm	4
Material Production Company – Small constructors	1
Project Management	1
Architectural Design Office / Green Building Consultancy	1
Investor / Constructor	2
Engineering Office / Green Building Consultancy	2
EXPERIENCE	
Less than 1 year	1
1-5 years	1
6-10 years	9
11-20 years	9
21-30 years	7
More than 30 years	-
CITY	
İstanbul	18
Ankara	9
EDUCATION	
Undergraduate	7
Graduate	14
Ph.D.	6
ROLE IN THE ASSESSMENT PROCESS	
Architectural design	8
Architectural design /Investor	1
Architectural design / BEATs assessor-consultant	2
Mechanical design	2
Mechanical design / Energy modeling / consultant	2
Mechanical design / BREEAM/LEED assessor-consultant / Energy modeling consultant	1
BREEAM/LEED assessor-consultant	5
BREEAM/LEED assessor-consultant / Energy modeling consultant / Acoustic modeling / consultant	1
BREEAM/LEED assessor-consultant / Energy modeling consultant	3
Energy modeling / consultant	1
Other	1
TOTAL	**27**

5.3.1.2 RESULTS ON THE CERTIFIED PROJECTS

In terms of the phase in which the decision to certify the project is taken (see Table 5-13), it is seen that for the majority of projects, the decision to certify the projects are taken before or during the conceptual design phase (41% before; 37% during). Even though this is considered as a beneficial aspect for introducing integrated design process and considering the environmental impact of buildings in advance, there lies a seminal problem. As has been maintained before, BEATs include a great number of credits related with the location of the project site. Therefore the certified projects arguably gain credits by coincidence. BEATs aim at guiding people to choose sites that are contaminated or close to amenities, in other words dense urban areas; therefore the study argues that these tools do not contribute to the decision on the selection of the site. In fact regarding the location of certified buildings in Turkey, they are usually located in these dense urban or industrial zones.

It is seen that there are projects which applied BEATs during the technical design phase. This is again a very controversial aspect, as before this phase most of the key design decisions for sustainability are already taken. In this sense, understanding the contribution of these tools to the technical design is an important topic, which will be detailed in the context of the case study projects in this study.

In terms of the rating received or targeted, it is seen that the projects evaluated by the professionals is representative for Turkey with respect to the average ratings achieved in Turkey.

Tab. 5-13: The phase of decision and the rating (Received / target)

	Number of Respondents
PHASE / CERTIFICATION	
Before choosing construction site	1
Before conceptual design (Sketch plans)	11
During conceptual design	10
During technical / Production design	4
After technical / production design	1
RATING (Received/Target)	
Outstanding	-
Excellent	3
Very Good	5
Good	6
Pass / Certified	-
Platinum	3
Gold	6
Silver	4

In the survey professionals were asked to evaluate the reasons for assessing the buildings that they have evaluated (Fig. 5-14). From these results, one of the major reasons of assessment is seen to be related with ‘gaining market advantage’ along with publicity value. It is quite striking that demonstrating environment friendly practices remained low compared to economic gains. It is again seen that we might speak of a significant contribution of the local municipalities. However the present study argues that if in Turkey this is the only way to raise awareness of the impact of buildings on environment and trigger new practices as well, then these tools must be robust in generating a pursuit of building practices towards sustainable paths.

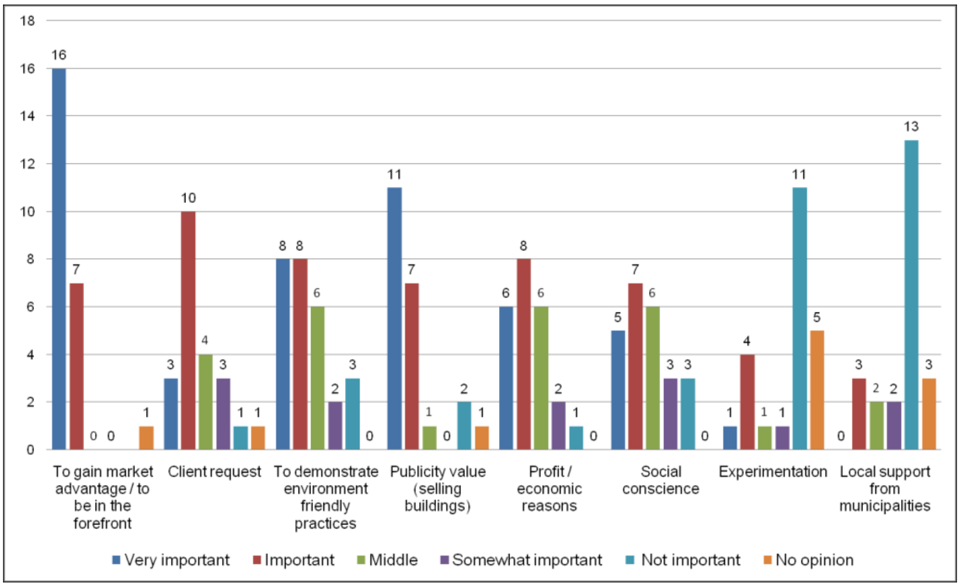


Fig. 5-14: Reasons for taking the decision to assess buildings

In the survey professionals were asked to evaluate problems they faced during the assessment process (see Fig. 5-15). It is seen that finding green certified materials and the lack of knowledge in minor constructors are considered to be highly problematic. Also the preparation of many documents for the assessment is evaluated as a problematic issue. Finding high efficient mechanical systems and green building technical information are seen to represent relatively less problematic. From the survey results, it is seen that the number of responses cannot yield an accurate estimation about how the differences between professionals from different disciplines reflects on these issues as problems. Even though the study cannot make this claim decisively, it is seen that architects (11 responses) responded that integrating environmental and financial performance assessments into the design process and the requirement of preparing many documents for BEATs represent them more problematic compared to the responses given by engineers and green building consultants.

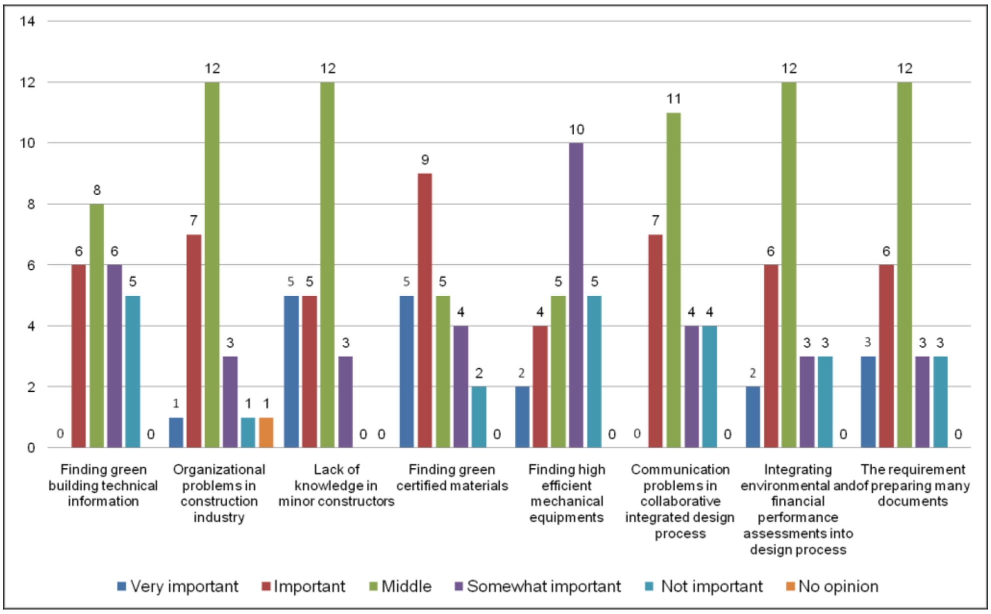


Fig. 5-15: Problems faced during the assessment process

5.3.1.3 THE CONTRIBUTIONS OF BEATS INTO DESIGN DECISIONS

In the survey, design professionals were asked to evaluate the contributions of BEATs into their design decisions (Fig. 5-16). It is seen that for the selection of site, the tools did not play a significant role. As has been noted above, currently in Turkey the decision to certify the buildings are usually taken after the start of the project design; therefore the responses that indicate that these tools contributed to the site selection is received with skepticism. Indeed, one respondent who answered this question as important indicates that the decision for assessment is taken in the technical design phase.[57]

From the survey results, the major contribution of these tools is seen to be on the design, in other words, on the choice of mechanical systems. According to the average mean of survey results in terms of impact, the second contribution is to the building façade design (including the choice of glass, insulation materials), the third is material choices, and the fourth is landscape design. It is seen that BEATs have less impact on what this study terms as main architectural design decisions, such as site plan, building form, zoning, and building direction. Actually these main architectural decisions are not limited to the criteria listed in BEATs; therefore these results seem to be meaningful in this respect. However the main problem underlined throughout this study is that these tools are seen to be considered as design guidelines, and as will be noted below the results of this survey indicates this as well. So for which decisions they act as a guide becomes an important issue. The question of whether they provide guiding for the technological fixes to the product still deserves attention.

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[57] Actually this is another reason why the author aims to implement this survey in future face-to-face, because it might have been the case that for this specific project certification was already in the mind of its developers and that they integrated it later in the design process. Nonetheless, the survey made it possible to tap into the perspective of the respondents about the use of these tools.

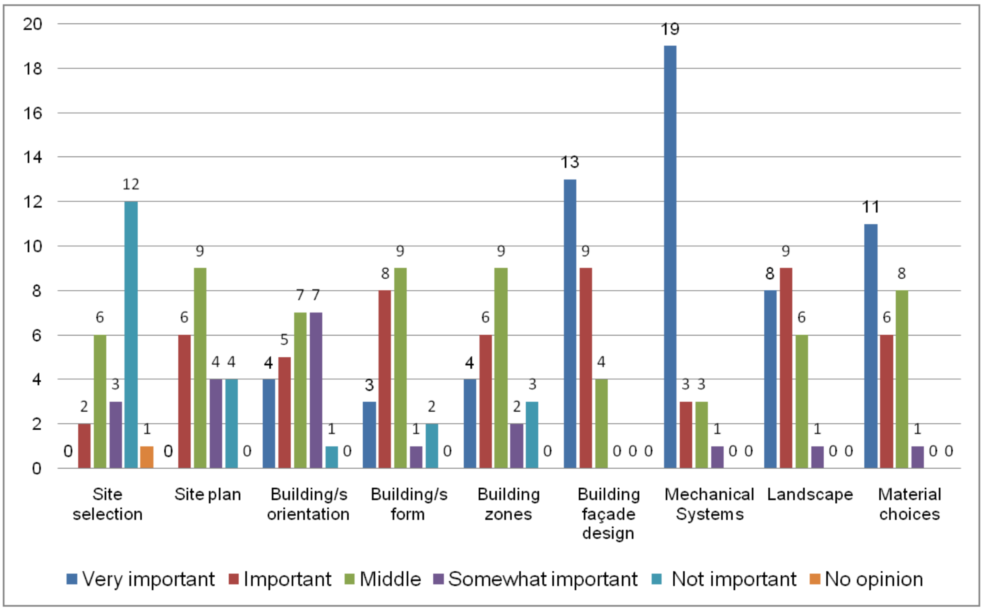


Fig.5-16: Evaluations of the role of BEATs on design decisions

Based on the literature review and the data collected over the case study projects, this study prepared a number of arguments to be evaluated by professionals.

The responses given to these arguments are given in Figure 5-17 and these responses are based on each argument below:

1. Certification tools enable integrated design process (IDP): The study aimed to understand whether the main problem in current normal practices, that is the lack of IDP, was possible to be addressed through the application of these tools and it is seen that in the majority of the cases this was possible.
2. Certification tools can be thought as design guidelines: It is seen that a great majority of professionals consider them as design guidelines.
3. Certification tools change “the main architectural design decisions”: In terms of affecting the main decisions, professionals evaluated this argument with a lower agreement. However there are responses that foresee this possibility.
4. Certification tools attribute more role to engineers than architects: The study specifically asked this question because over a number of meetings attended by the author of this study, it was possible to come across this phrase. Regarding the responses it is possible to state that this argument holds true for some people.
5. Building occupants must have a word in design decisions: This argument was included to understand whether professionals consider the role of their design products once these products become designs-in-practice, because this study argues for integrating people who would live in these buildings into the process. It is seen that the responses are distributed into three ranges. So this aspect should be a prominent topic of future study (that is, understanding the designers’ approach to future occupants).
6. As the certificate criteria are independent from each other as a checklist, this might hamper holistic thinking in designing: This argument was developed over the literature review and the research carried by this study.

It is seen that a great majority of professionals did not agree with this argument. This aspect will be discussed in the context of the case studies.

7. If a project gains some of the credits from certificate, it is a green building: This argument was queried to gain their opinion on what a green building should be equipped with. It is seen that there are people who agree with this argumentation. However it is possible to argue that people are aware of inadequacies.
8. Certification tools help us to understand local requirements and prospects and enable us to integrate them into design: This argument was included to probe whether the limited scale of BEATs is considered a problem by professionals. On the average it is seen that professionals did not agree with this argument.
9. Augmentation in the number of certified buildings will direct the building industry into a sustainable path: It is seen that a great majority foresee benefits.

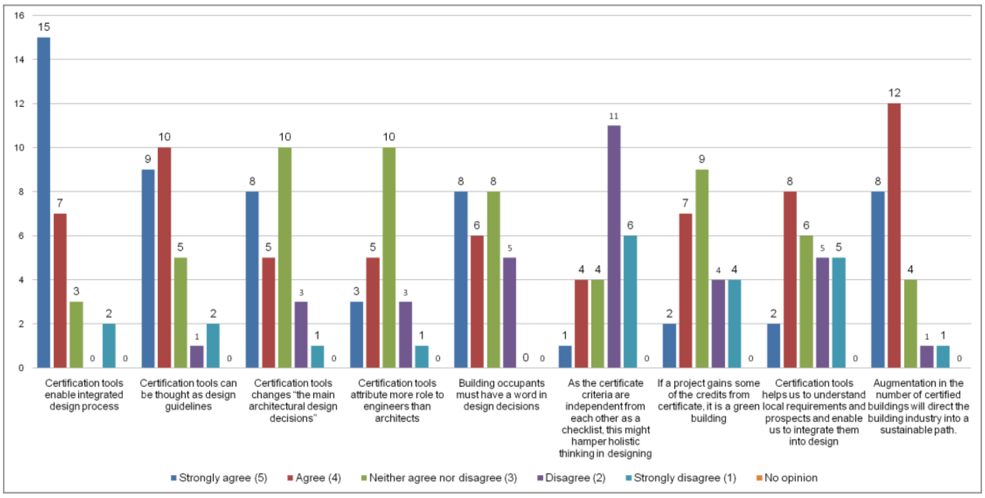


Fig.5-17: Evaluations of the arguments posed in the survey

As stated before, the survey asked the same questions to professionals who did not work in these projects. The study will not perform a statistical analysis to compare the results of these two groups because the number of responses is not enough and the study does not aim to delve into their opinions about these tools.

5.3.2 RESULTS OF THE SECOND GROUP

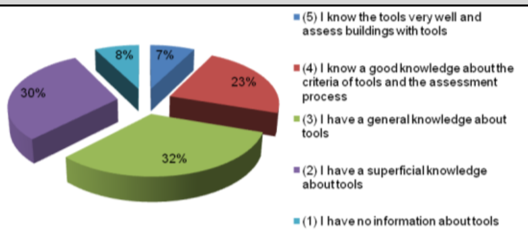
This section shares the results of survey questionnaire completed by people working have not worked in certified projects.

5.3.2.1 RESPONDENTS' CHARACTERISTICS

The personal characteristics of respondents are presented in Table 5-14. The majority of respondents are seen to be architects working at universities. In terms of experience in the field, it is possible to argue that Group 2 reflects the opinions of a variety of groups.

Tab. 5-14: Personal characteristics and work experience of respondents in Group 2

	Number of Respondents
PROFESSION	
Architect	79
Interior Designer	5
Mechanical Engineer	11
Civil Engineer	5
Environmental Engineer	3
Other	3
SECTOR	
Public institutions	5
Education / research	47
Education / research / Architectural Design Office	1
Investor company	2
Constructor	9
Investor company / Constructor	2
Architectural Design Office	21
Architectural Design Office / Green Building Consulting Firm	1
Architectural Design Office / Investor company / Engineering Office	1
Architectural Design Office / Public institutions	1
Engineering Office	3
Green Building Consulting Firm	-
Material Production Company – Small constructors	10
Other	3
EXPERIENCE	
Less than 1 year	1
1-5 years	22
6-10 years	30
11-20 years	32
21-30 years	12
More than 30 years	9
CITY	
İstanbul	36
Ankara	37
İzmir	8
Other	25
EDUCATION	
Undergraduate	35
Graduate	35
Ph.D.	36
KNOWLEDGE ABOUT BEATs	



TOTAL	**106**

5.3.2.2 THE ROLE OF BEATS IN PROJECTS

The survey asked professionals when it would be more beneficial to take the decision to assess buildings with BEATs. A great majority replied that it should be before the selection of the construction site. With respect to the knowledge about these tools, it is seen that professionals who have better knowledge about these tools responded mostly to take the decision before the site selection. However the study considers that generally people are aware that design decisions taken early in the process have a higher impact on the sustainability of buildings.

Tab. 5-15: Estimations about the phase of decision to certify in Group 2

	Number of Respondents
PHASE	
Before choosing construction site	58
Before conceptual design (Sketch plans)	33
During conceptual design	24
During technical / Production design	1
After technical / production design	-

The survey asked professionals to share their opinion about what would be the influence of tools while taking the design decisions (Fig.5-18). From the overall responses, it is possible to talk of a parallelism between the responses given by Group 1, in terms of the responses given to the contribution of these to the design of building façade, mechanical systems and material choices. This indicates that people are more or less informed, or can estimate, the role of these tools. However compared to Group 1, this group foresees that the tools could contribute more to the site selection, site plan, building zoning, direction, and form. Their evaluation of the contribution to the landscape design, however, was lower compared to Group 1.

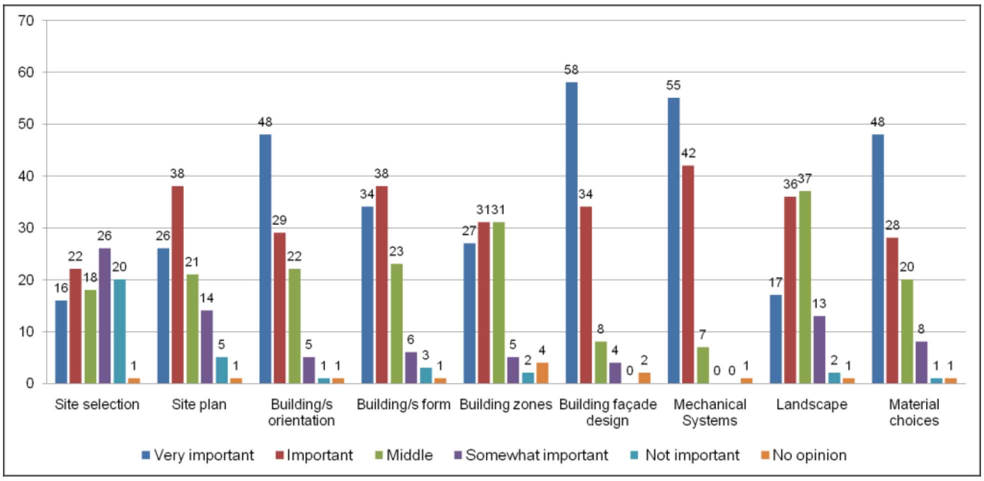


Fig.5-18: Evaluations about the possible role of BEATs on design decisions in Group 2

When the mean averages of responses given to the knowledge about these tools are considered, the study observes that the responses given by professionals who have indicated that they have good knowledge (4-5) about BEATs seem to be in line with the responses given by Group 1 (Fig. 5-19). Those holding a limited knowledge about BEATs do not see the contribution of tools to the landscape design.

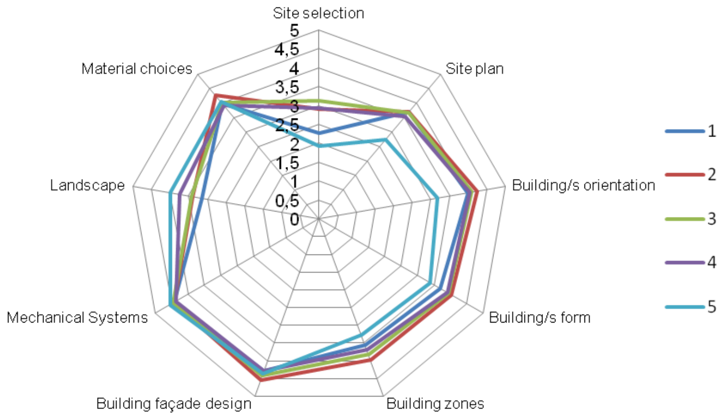


Fig.5-19: Evaluations about the possible role of BEATs on design decisions compared to knowledge about BEATs.

Overall, the study considers these results as an indication of a belief in the abilities of these tools to change some practices in the design process.

As mentioned before, the arguments evaluated by Group 1 were also probed in Group 2. To analyze the responses of Group 2, the study differentiated between the responses with respect to the knowledge held about these tools (For the graphics, see Appendix 2). Herein the study shares the interpretations based on these results.

1. Certification tools change “the main architectural design decisions”: It is seen that professionals foresee that BEATs can change these main decisions. While professionals who have a superficial knowledge (2) replied that they strongly agree with the argument, it is seen the evaluations of the other groups (3-4-5) do not yield a definitive approach to the tools. Their responses vary.
2. Certification tools enable integrated design process: Overall, all the professionals agree that BEATs enable IDP, even though there are disagreements.
3. Certification tools can be thought as design guidelines: It is seen that a great majority of professionals consider BEATs as design guidelines.
4. Certification tools attribute more role to engineers than architects: The responses to this argument among all the groups are equivocal.
5. Building occupants must have a word in design decisions: Here, too, the responses do not yield an unequivocal stance. However it is interesting for this study to observe that there are professionals who disagree with this argument.
6. As the certificate criteria are independent from each other as a checklist, this might hamper holistic thinking in designing: It is seen that professionals neither agree nor disagree with this argument. The number of professionals who disagree is considerably high especially in professionals who have a good knowledge about BEATs (4-5).
7. If a project gains some of the credits from certificate, it is a green building: Again there is no unequivocal tendency in the results. However it is seen that there is a considerable number of responses for disagreements, and

the study cannot claim that the responses are related with the knowledge held.

8. Certification tools help us to understand local requirements and prospects and enable us to integrate them into design: Even though the responses are distributed along the agreement scale, it is seen that the number of agreements is higher compared to disagreements.
9. Certification tools changes the understanding of sustainable lifestyle: It is seen that professionals tend to agree with this argument. The knowledge about these tools is seen to have an impact on the evaluation of this argument. While professionals with a limited or superficial knowledge (2-3) are seen to be more in agreement, professional with good knowledge (4) are undecided.
10. Augmentation in the number of certified buildings will direct the building industry into a sustainable path: The professionals in this group see the tools as a vehicle for changing industry.

5.3.3 A GENERAL REMARK ABOUT THE RESULTS OF THE SURVEY

Based on the responses given by Group 2, it is not possible to state they represent a uniform stance towards these tools. Their knowledge too about these tools does seem not to change their approach to the last argument posed in the survey. Their knowledge seems to indicate that professionals who have a limited knowledge have significant expectations from these tools in the design process, compared to Group 1. For Group 2, it is seen that professionals are aware that these tools could possibly have more influence on the mechanical system and material choices.

5.3.4 WHAT DOES A SUSTAINABLE BUILDING MEAN?

Currently in the Turkish context, there is no research that details what people understand from sustainability in built environment. In addition there seems to no research on how these tools influence people's approach to the sustainability in built environment. Conducting such a broad research is beyond the scope of this study. However this study needs to gain a general understanding of the current discourse of sustainability in the Turkish context to delineate the meaning of sustainability, if recruited in the design practices. Furthermore, the study aims at understanding whether these meanings have any parallel in the ecological worldview. In this sense, the survey asked both groups of design professionals to define what a sustainable building means.

Out of 27 professionals in the 1st group, 17 of them gave brief definitions, which are provided in Appendix 2. Out of 106 professionals in the 2nd group gave 70 definitions. After reading all the definitions, the study coded them according to the key aspects of sustainability framed by ecological worldview. From the data there emerged three categories: (1) Green building, very close to the definition espoused by BEATs, buildings that do not harm nature; (2) Very close to the definition of green building however includes aspects like flexibility and economical considerations; (3) Definitions that fall majorly in the regenerative paradigm. To explain better how the study coded and formed these categories, below is given definitions drawn from each category:

1st category:

> "Sustainable building = green building"
> "Buildings that do less harm to nature during the construction and during the usage."
> "Buildings that reduce their impact on ecology over its lifetime, that is starting from its construction till its demolishment, that require less maintenance, use energy efficiently, maintain a very good level of comfort for humans."

2nd category:

> "These buildings might be buildings designed with a peaceful relationship with nature. They can be attained as a result of a design that aims at being both harmless and contributing to natural environment, rather than being a design for its own sake."
> "Sustainable building is a building that uses most effectively the climate and regional characteristic with its architectural space, the use of material, the direction on site. It is possible to see various application of this type of building in local architectural examples. Based on these examples, along with the contemporary sustainability technologies, provided that they are conceived more healthy and long-time usage the number of sustainable buildings will increase."

3rd category:

> "Buildings that benefit from the resources of its context (Not limited to natural environment, this includes economical and socio-cultural conditions), but do not consume them; that can sustain its physical life (longer than a certain lifetime); that can adapt to the changing functional requirements."

Furthermore to understand whether the practice with BEATs influences the approach to sustainability the study first divided these definitions into two groups: (1) Group 1: Professionals who worked with BEATs, (2) Group 2: Professionals without prior practice. Second, to understand whether the criteria included in the tools, or in general, the sustainability definition espoused by the tools has an impact on the professionals' approach to sustainability, the study divided the definitions of the Group 2 based on the respondents' knowledge about tools.

5.3.4.1 RESPONSES OF THE FIRST GROUP

From the review of these definitions, the study observes that 8 definitions are in the 1st category, 5 definitions in the 2nd, and 4 definitions in the 3rd category.

For the 1st category it is seen that 5 definitions out of 9 are given by architects. These definitions are seen to follow the approach of these tools to sustainability. Most of these definitions are seen to be in line with the definition of green building; therefore the socio-cultural aspects and the local exigencies that a building must contribute to are not included in these definitions. Although two definitions cannot be considered to be in line with BEATs, their accent is placed on the protection of nature, and they refer to the definition green building, too. A number of definitions in this category also underline the importance of passive design strategies. Herein the study aims to share the definition and the comment provided by a green building assessor:

> Sustainable buildings are buildings that do not harm nature and that thereby do not prevent their use by future generations according to needs of the latter. It is not possible to design sustainable buildings with current production techniques.

As for the 2nd category, it is seen 2 definitions integrate economic criteria into its description of sustainable buildings and the other two include refers to social and functional aspects that these building must fulfill. The other one includes the socio-cultural dimension of sustainability with a particular approach to culture, rather than confining the social dimension to comfort requirements.

The definitions categorized under the 3rd category can be considered more or less considered in line with an ecological worldview. These definitions consider the long-time use and the integration not only with local environmental conditions but also integration with the local cultural environment. Especially in one definition, a comparison of a sustainable building with a 'living organism' deserves attention (Item 6, Appendix 16).

5.3.4.2 RESPONSES OF THE SECOND GROUP

With respect to the coding of the definitions given by Group 2, the following table is prepared. There are 52 definitions given by architects in this group (1st category: 26; 2nd category: 15; 3rd category: 12).

Tab. 5-16: Definitions of a sustainable building of Group 2

Knowledge	Number of responses	1	2	3
1	3	2	1	-
2	20	10	4	6
3	23	10	7	6
4	18	12	5	1
5	6	3	3	-
TOTAL	70	37	20	13

The study claims that the definitions found in the 1st category and written by professionals who have good knowledge of BEATs (4-5) are defined represent significant similarities to the criteria included in BEATs. With respect to the percentage of the 1st category definitions to the overall number of definitions included in the professionals with a good knowledge (4), this represents a very high percentage if compared to the percentage of other groups of professionals.

Regardless of the categories defined for knowledge of professionals, it is seen that sustainability is still framed with the approach of green buildings that work efficiently and that do not harm nature. What is essential for this study is that these definitions categorized under the 1st category lacked sensitiveness to the culture or local context in terms of the contribution of the building to its local environment. For the 2nd category definitions one important aspect that separates the 2nd category definitions is the accent put on the aspect of flexibility and longer usage of a building to fulfill future requirements.

5.3.4.3 COMMENTS INCLUDED IN THE SURVEY

While conducting this survey, the author of this study did not expect to find the comments box filled, as is usually the case with survey questionnaires. However there were 30 comments that must be addressed in the context of this study. In the survey, there are seminal comments regarding the benefits of these tools and suggestions to enable their dissemination in the market, accompanied with recommendations to develop local tools.

Even though one respondent does not believe that these tools would make buildings sustainable, and considers the pyramids, the housings in Mardin, etc. as sustainable buildings owing to the fact that they have been occupied for centuries, s/he underlines that these tools might at least remind the design professionals about these forgotten values. In a similar vein, another respondent considers that these tools at least show some good pathways in designing.

In contrast to these hopeful comments, it is seen that there is a certain sensitivity on a topic in the field, and that is the use of BEATs as a vehicle for marketing projects. In a number of comments professionals underlined that certain buildings, only through minor adjustments, can receive certification with ease and this might actually lead to what is called green-wash. In another response, the use of these tools for marketing projects is considered to be normal for building developers owing to the fact that they need to consider economic benefits. Therefore the respondent underlines that, in order to introduce the concept of green buildings into this context, the key is to have a conscious society, in other words, the demand side that guides the developers. One respondent suggests “regarding the definition of environment-friendly buildings, it is necessary to find out if a building actually does have certification.” Another one underlined that sustainability cannot be assessed with certain levels. This respondent considers this as an epistemological problem. In the same manner, another professional considers these tools to be a product of western society.

Herein the study aims to further develop this topic. For example there are 18 buildings which are registered to the LEED program in 2009, but only 10 of them are seen to have received certification as of March 2013. This has become one of the main debates in Turkey; new construction buildings for the sake of publicity put LEED in the advertisements, but do not receive the certification. Another instance which approached with skepticism in this study can be exemplified over the following building project, called Maslak 1453 and registered to LEED in September 2012.[58] There is an ongoing court case against this project for not being in accordance with the development plans. The problems brought to court are beyond the scope of this study; however the relevance of this project for this study is that it is built in an area boarding one of the main green areas of İstanbul, and it is assumed that it will be a green building. The study refers to this project to indicate not only a possible mentality that is engendered by the introduction of LEED into this context, but also the problem stemming from the LEED as it accepts this project for certification.

[58] http://www.maslak1453.com/. Information regarding LEED is given on the website.

Fig. 5-20: A project development registered to LEED, Maslak 1453, İstanbul[59]

5.4 SUMMARY

This chapter aimed at giving a perspective of sustainability issues in Turkey. By drawing on the routine design process in Turkey and problems pertaining to the loosely coupled nature of construction process, the study first discussed socio-technical regimes active on the formation of the building sector in Turkey. It introduced the main barriers to implement green building practices in this context. Second, it shared the results of the survey conducted to understand both the impact of BEATs on certified projects and the current approach to these tools in the field. This section did not discuss in detail the role of BEATs in changing project courses, because without a detailed account on case studies such a discussion would not be able to represent the real picture.

In terms of the influence of these tools in taking design decisions, it is seen that they have interacted especially with the decision on the mechanical systems, material choices and landscape design. Moreover for a majority of projects BEATs enabled pursing an integrated design process. It is seen that one of the hypotheses developed in the literature review, that is "the disconnection of criteria might hamper a holistic approach to designing," is not considered as a problem by professionals who worked with BEATs. Furthermore, regardless of the criticism raised against these tools, including the criticism by the respondents of the survey, it is seen that in the Turkish context BEATs are seen as a vehicle for attaining a sustainability path in future. The survey results of Group 2 show that the expectations from these tools to change the building practices (that is, changing the main architectural decisions) are high. In reading through the definition of sustainable buildings given by professionals who worked with BEATs, the study underlined that these definitions were line with definitions of green buildings. In the same manner based on the definitions of sustainable building given by professionals who have not worked in these projects, the study foresees that sustainability for buildings is still framed with a mechanistic approach that propels conceiving individually the buildings that are detached from their urbanscape and cultural context.

[59] Picture taken from http://www.emlaktasondakika.com/haber/Konut_Projeleri/ Agaoglu_Maslak_1453_nerede/34666.aspx (accessed March 8, 2013)

CHAPTER 6

LEED/BREEAM IN PRACTICE: CASE STUDIES

So far the study has discussed the reasons why current socio-technical systems are inefficient in responding to the challenges imposed by sustainability problems. In line with this discussion, for the field of architecture, the study argued that BEATs might not be able to lead building practices towards sustainability transition, due to their espoused worldview upon which their assessment mechanism is built. The study detailed possible consequences of the applications of BEATs in projects; however it has not specifically focused on the real impact of these tools on design practices and the worldviews of architects. Chapter 4 discussed the characteristics of niche innovations, along with their role in changing the overall regime. The study assumed that practices with BEATs are currently niche practices in Turkey. Therefore this chapter evaluates six case study projects from Turkey, which are certified or are in the assessment process with BREEAM or LEED. The analysis is performed based on the models developed in chapter 4 to reveal, first, the differences of practices with BEATs from practices-as-entities, that is, the regime practices. Second, the analysis indicates possible niche-regime interactions owing to BEATs. Third, with respect to the three dimensions of sustainability (scale, time, and criteria) discussed in chapter 3, the analysis examines the emergent practice, that is, the practice with BEATs in terms of its premises for the regenerative paradigm. To this end, the main objectives of this chapter can be summarized as follows: How do BEATs interact with the routine practices of architects? How much do these practices deviate from the routine practice of the architect? How do these practices touch the regimes in socio-technical system of built environment?

The previous chapters examined the reasons why current socio-technical systems are inefficient in responding to the challenges imposed by sustainability problems. Along with this examination, the study discussed in detail why BEATs cannot be considered as adequate guides for attaining sustainability in architecture with respect to the general framework defined by the regenerative paradigm. Chapter 4 argued that built environment represents a socio-technical system to which building practices are bound. Therefore the study put forth the argument that design practices are structured based on the rules of the regimes active on the formation of the socio-technical system. So the present study adopts a holistic approach to analyze design practices. Therefore to examine design practices framed by BEATs the study prepared an analysis framework based on studies in SPT. While considering knowledge/skills, image/meaning, and materials as elements of architectural practices, the study put forth the idea that practices-as-performances are structured by practice-as-entity, or routine practices. By the same token, while discussing how certain regimes, or systems of provisions, have interdependency among each other, Chapter 4 suggested going beyond the examination of practices and looking for possible practice-regime interactions. For studying these interactions, the study developed a framework that integrates the SPT approach with that of the MLP. Chapter 5 gave a brief description of the current dominant socio-technical regimes influential on the building sector and revealed why practices with BEATs are conceived as niches with respect to their number and the rules followed by regime practitioners. Through the responses given to the survey questionnaires prepared by this study, Chapter 5 gave a representation of the understanding of sustainable building in Turkey, and shared the results pertaining to the certified buildings. It prepared the ground for comparing regime practices with the practices framed by BEATs, so as to determine the level of innovation in these new processes in chapter 7.

Even though the previous chapters argued for the inadequacy of these tools, it has not particularly discussed what their implications are on real projects and therefore on the architects' worldviews. This chapter evaluates six case study projects from Turkey, which are certified or are in the assessment process with BREEAM or LEED. The analysis is performed based on the models developed in chapter 4, to reveal, first, the differences of practices with BEATs from practices-as-entities, that is, the regime practices. Second, the analysis indicates possible niche-regime interactions owing to BEATs. Third, the emergent practices, that is, the practices with BEATs, are examined with respect to the three dimensions of sustainability (scale, time, and criteria) discussed in chapter 3. This examination allows us to discuss both the role of BEATs and the role of the background of the architect in aligning their practices to the regenerative paradigm. In fact, with regard to the role of rules in shaping the regime practices, Chapter 6 prepares the ground for discussing whether these practices with BEATs deviate from these rules and make radical innovations that would enable sustainability transition. To this end, the main objectives of this chapter can be summarized as follows: How do BEATs interact with the routine practices of architects? How much do these practices deviate from the routine practice of the architect? How do these practices touch the regimes in socio-technical system of built environment?

This chapter is divided into four sections. While the first section gives a brief account about the case study projects and analysis levels –case study level and cross-case studies level–, the following six sections detail the first level of analysis for each project. The final section shares the results of the second level analysis that reveals the recurring patterns among these case studies.

6.1 ANALYSIS OF CASE STUDIES

6.1.1 FIRST LEVEL ANALYSIS (CASE STUDY LEVEL)

The analysis started with the coding of data on case study projects: Transcripts of the semi-structured interviews with architects, if available, project meeting documents, published materials about projects, interviews with architects published in magazines, and web-casting of project representations made by architects. For projects A, B, and C, the author of this study conducted interviews with architects and gathered data pertaining to the projects. For projects D, E, and F, the author gathered data from secondary sources. The details about projects and the data gathered for analysis are given in Tab. 6-1 and Tab. 6-2. The first level analysis of case studies involved a multi-level coding:

1. First cycle: Coding of the data with respect to codes drawn from the practice model: “Knowledge, material, meaning.”
2. Second cycle: Coding of these elements with respect to the practices (normal/existing) or (emergent/new) practices.
3. Third cycle: Determination of the impact of BREEAM or LEED in the formation of these new elements.
4. Fourth cycle: Coding of regime interactions, not only in terms of the influence of practices with BEATs on regimes, but also constraining effects of regimes on these practices.
5. Fifth cycle: Coding of emergent phenomena from the data.[1]

Following the coding process, the study analyzed these codes to formulate an operational diagram composed of the categories or themes, which can explain the relationship between the existing practice of the architect and the emergent practice with BEATs. This model is generated for each project. Beyond the explanation of the new practice, this model enables the study to foresee how the architects understood the role of BEATs. This model will be used for three types of evaluation: (1) To demarcate how much the new/emergent practice (practice-as-performance) deviates from the rules governing the regime practices (practices-as-entities) in Turkey; (2) To detail particular instances in which the new practice is constrained by regime rules or enables new considerations in regimes; (3) To evaluate the new practice with respect to the rules defined by the regenerative paradigm framed by ecological worldview.

6.1.2 SECOND LEVEL ANALYSIS (CROSS-CASE STUDIES LEVEL)

This level first starts with the comparison of operational diagrams which represent recurring similar patterns and understandings among case studies. Second, it looks for similar patterns emerging from the interaction between these practices and regimes, such as energy, transport or planning.

[1] This level of coding reveals especially the role of owner/developer and the integrated design process.

Tab. 6-1: Details about case studies (A-B-C)

Case Studies	Case study A	Case Study B	Case Study C
Building Function	Office building	FRITERM Factory Factory building and its office block	Tarsu Shopping center
Location	Köşk, Aydın	Dilovası / Kocaeli	Tarsus, Mersin
Climate	Mild	Marmara climate	Mediterranean climate (very hot summers, mild winters, humidity is very high)
Assessment tool	LEED-NC v2009	BREEAM International 2009 Europe Commercial: Industrial	BREEAM International 2008 Europe: Retail
Intended or achieved rating	Platinum	Excellent	Very Good
The decision to certify / phase	During the conceptual design	During the technical design phase (The project has passed through a major revision process after the decision)	Before the technical design phase (The project brief of conceptual design includes the condition of designing eco-friendly design features)
Project phase / architects	Architect A (conceptual + technical phase)	Architect B (conceptual + technical phase)	Conceptual design by a company from USA. Architects C in Turkey (technical design phase)
Data	Architect LEED assessor Project documents (Drawings)	Architect BREEAM assessor Project documents (Drawings, project meeting documents, inter-firm documents)	Architects (Due to confidentiality of detailed technical project drawings, the drawings are taken from architectural magazines, articles on the building)
Owner type	Corporate: Privately Held	Corporate: Privately Held	Retail property company
The experience of architect in this type of projects	None	None	None
Project start	2011	1996	2009
Construction start	-	end of 2010 (under construction)	2011
Current status of the project	Mid-technical design phase (Due to the economical problems of the owner, project stopped)	Construction	Opened in 2012
Building area	2000 m^2	2000 m^2 (Office) + 34.000 m^2 (Factory, production area)	63.000 m^2

Tab. 6-2: Details about case studies (D-E-F)

Case Studies	Case study D	Case Study E	Case Study F
Building Function	AkPlaza / Office Building	35. Sokak Housing Development	Turkey Contractor's Association Headquarters / Office Building
Location	İstanbul	İzmir	Ankara
Climate	Marmara	Mediterranean	Continental
Assessment tool	BREEAM International 2009 Europe Commercial	BREEAM International 2010 Bespoke	LEED-NC v2009
Intended or achieved rating	Very good	Very Good (Interim)	Platinum
The decision to certify / phase	During the conceptual design	During the conceptual design	Before the technical design phase
Project phase / architects	Architect D (conceptual + technical phase)	Architect E (conceptual + technical phase)	Architect F (conceptual + technical phase)
Data	Secondary sources, interviews with the architects appeared in magazines	Secondary sources, interviews with the architects appeared in magazines	Secondary sources, interviews with the architects appeared in magazines
Owner type	Developer	Developer	Civil organization
The experience of architect in this type of projects	First project with tools / Have a good knowledge	None	Have a good knowledge
Project start	2007	2010	2010
Construction start	2011(under construction)	end of 2010 (under construction)	2011(under construction)
Current status of the project	Construction	Construction	Construction
Building area	49.276 m^2	555 houses	5.500 m^2

6.2 AN OFFICE BUILDING IN AYDIN[2]

6.2.1 PROJECT DETAILS

The case study project A is a small office building of a very big group company working in the geothermal energy sector. This company established the first geothermal electric central in Turkey and works in the sector of geothermal tourism and geothermal agriculture as well. Case study A is located in Aydın, a city located in the Aegean region and having a mild climate. The building site is located next to the geothermal energy central of the company group. The architect of case study A holds a bachelor degree in architecture and has an experience of more than 20 years in the field.

The design of the small office building, which will serve the workers and the managers of the geothermal energy company, started in 2011. During the brief, the architect informed the present author that there were no intentions "to have such

[2] The name of the building is not shared in this study owing to the confidentiality of name of the company.

quality," that is, a green building. During the first site visit, the architect explains how she was impressed of both the energy central and the surrounding natural landscape. In her words: "Very clean, it takes from nature, produces energy, and gives back the hot water to the nature. I noticed this when I first came to visit the site."[3] This renewable energy on site will actually supply the energy requirement of the new building. Following this first visit, the architect prepares the conceptual design projects without any contact with engineers or without any sort of "green" expectations. This impression about the renewable energy, what might be called as well meanings or images of energy, is seen to be translated in the conceptual design based on a metaphorical approach. Regarding the sector of the company and the importance of this renewable energy, the architect decides to put heating center on the ground floor in the entrance lobby (see Appendix 3). She explains further that she was quite afraid of not being able to make this design decision accepted by the project owner (because she thinks that this might be a risky attitude (putting the heating area in the entrance); and therefore she prepares another conceptual design to present to the owner.

During the first meeting with the company, the owner asks the architect to present the first alternative, rather than the second one.[4] Following the approval of the first alternative, the idea of certifying this project comes to the mind of the architect. While offering this suggestion, she reported that a parallel idea was also developed in the company in regard to its position in the sector of renewable energies. Following the decision of certification, the architect informs the client that "[t]his work is beyond the practice of architectural design; it requires us to work as well with mechanical engineers, because they will solve this system."[5] The mechanical engineer and the electrical engineer suggested by the architect are well known in the field of green building design and the architect has been working with the same team before this project. The mechanical engineer suggests working with one of the well-known BREEAM assessor firms in the field and this firm introduces other partners to the project: Simulation and acoustical simulation companies. The team decides to certify the project with LEED.

Following the establishment of the project group, project meetings started. Owing to the energy supply of the building, it is explained that the project can easily receive Platinum rating. However "the intention of the whole team was first to design a good building and then assess it."[6] The BREEAM assessor informed the present author that the process of certification started with the pre-assessment of the building in terms of the energy simulation of the building and the necessary revisions to render the building into an optimum condition. The BREEAM assessor recommended making the criteria review after these revisions in the project. Currently the team has finished the technical drawings including the decisions on materials. However due to the client's unexpected economic problems, the client decided to stop the project for a while. The project has stopped after the technical design phase, and therefore it is not possible to trace how the re-assessment, in

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[3] Architect A, Interviews held with the Architect of the office building in Aydın, April-May-June, 2012.
[4] This choice is explained by the architect to be related to the intelligence of the owner.
[5] Ibid.
[6] Ibid.

terms of criteria by criteria evaluation is conducted. However this aspect is foreseen as a benefit for the study, because it allows the study to reveal the influence of these tools at this design phase.[7]

Fig. 6-1: Case Study A: Northern façade

Fig. 6-2: Case Study A: Southern Façade

[7] A number of project renders are shared here, the project drawings are given in appendix 3.

Fig. 6-3: Case Study A: Eastern Façade

Fig. 6-4: Case Study A: Interior perspective renders

6.2.2 PRACTICE WITH LEED

The analysis of case study A reveals the operational diagram in Fig. 6-5, which defines the overall meaning of the new or emergent practice with LEED for the architect. The diagram represents the design process, including the multi-disciplinary design team, which is crucial in attaining an integrated design process. While the left side indicates the existing practice, which has generated the first conceptual design alternative, in the center the new/emergent practice is identified. For case study A, we observe the formation of one central theme, which denotes the meaning of the practices with BEATs for the architect. The central theme, in the architect's words, the "right architectural design", actually brings together three major categories: Existing practice, LEED, and the emergent practice. The study here examines the relationships between these categories.

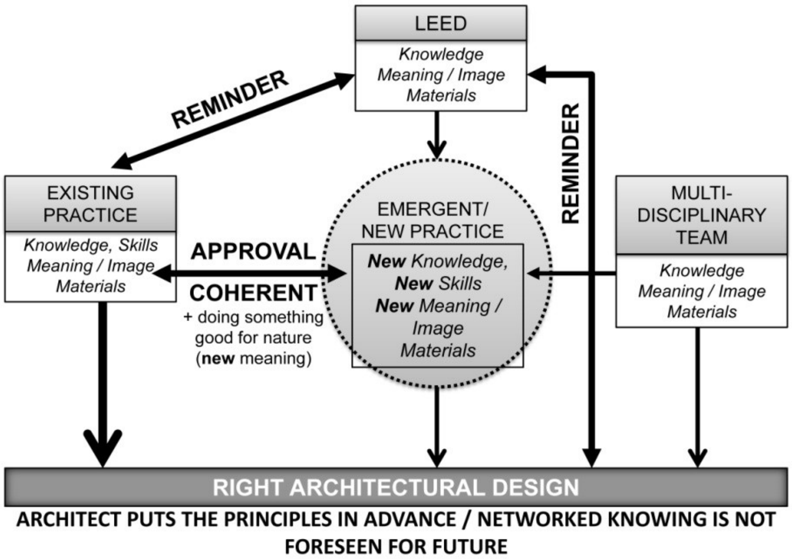

Fig. 6-5: Operational diagram of design practices for case study A

Existing knowledge, skills / meaning

The main sector of the company is the production of renewable energy from geothermal hot water. This energy is also used for the office building. This idea is seen to be translated into a metaphorical image for the design of building. The architect locates the heating center into the entrance floor, and comments:

> If we are using an interesting system that uses hot water, why should we put the heating center at the basement as we usually do. Instead I wanted to make a difference and I placed it right in the lobby, I wanted it to become a focus point, a focus point of the project, and I put the system into a shopwindow for the purpose of exhibition… I used this source based on my own inner feelings. I wanted to make a show… That was the idea, nothing more. I wasn't thinking at that time that it would go that much farther.[8]

The architect informs us that she usually starts designing from the inside towards the outside, that is, she starts from the interior design of the building. The meaning of energy is used as a driving concept for the project design; however, it remains

[8] Ibid.

only as an image of the heating center. Nevertheless, the existing meaning of the image the architect suggested led the client to have the building certified.

Existing knowledge, skills / LEED / Emergent practice

In order to reduce the energy demand of the building, in line with LEED and following an integrated design process (IDP), the whole team focuses on optimizing the building. The study came across the architect's references to her background knowledge about designing sustainably on a number occasions and what she has later termed as "right architectural design":

> The IDP group has directed us. We should start from the architectural design. Building form, the direction of buildings, its place. These features were always part of my practice […] We closed the western façade. The engineer and BREEAM assessor told me that it is not enough to close [this façade]; we have to cool it as well. We put trees in front of the façade, in the landscape design. Then these trees have to be endemic. This goes like a chain reaction. These things are taught at the first grade of the bachelor education in the university; these are not different things. You just have to remember. To make an economical building… If you put a lot of windows, you have to put curtains and air-conditioning. You have to increase the power of air-conditioners, which means electricity. You put an opaque wall; you finish everything. The whole principle is to do right architectural design.
>
> I was informed that the existing conceptual design was designed in line with these principles…
>
> What we did in the process is all about these details. Actually our process with other professionals is nothing more than this.
> …
> Then LEED is like a reminder list in a certain format.[9]

LEED actually acted as a reminder of her background knowledge about designing. However, the accent put on the chain reaction is a good example for representing the interaction among criteria. Thus the emergent practice respects this interaction among criteria and integrates them into the design.

The architect gained new knowledge about the design of green roof, because before LEED she said she saw pans, on which you plant, but was not able to understand its functioning. Furthermore, for the southern façade they had to add sun shades and also change the glass types to reduce heat gain. In the architect's words, "[y]ou have to work with the optimums."[10] In this sense, she gained new knowledge about new materials.

Existing practice (knowledge, skills, meaning)

The project revisions show that even the first sketches of the design are very similar to the final building. The design has not changed excessively. The first reason for this similarity is explained to be rooted in the right design decisions taken by the architect before LEED in terms of building form and directions. The second reason is explained to be related with the architect's routine practice. She claims that she can defend her first ideas, sketches and continues as follows:

[9] Ibid.
[10] Ibid.

> In whatever project you are designing, if you are to bring quality to people's lifestyle in their work place or house. This quality is about ergonomic quality, not the quality in terms of materials. This would bring quality to their physical place and people would live happily. People don't know why they do like certain places. It is because the lightening is right, the proportions are right. They like it but they can't indicate the reason. If you can bring this quality of space, and if you believe in it, then you can transmit this feeling. Then people appreciate it.[11]

This means the emergent practice has these background routines. We can conclude that LEED did not have an influential role in altering the conceptual design phase of the architect.

Existing skills / Existing material (CAD tools)

Even though these buildings require the integration of engineering and architectural projects, possibly through the use of more sophisticated CAD tools, the design team still relies on Autodesk AutoCAD 2D software. They have to check each project: Architectural, civil engineering project, mechanical project… This process is very similar to existing practices.

Existing materials / LEED

Another point the architect refers to is related to the material criteria of LEED: Local materials and materials with recycled content or renewable materials. Before LEED, the floor finishing material was decided to be industrial parquetry. She maintains that

> When we started working with LEED, I learnt that this material is made out of leftovers from the production of normal parquet that is processed. This is a recycled material.[12]

This illustrates the role of LEED in fostering awareness of one's practices. This point is seen in the comments below too:

> I use the natural stone of this region in the conceptual design. For example, this was a good coincidence. In fact the use of a material of another region, let's say Diyarbakır [a region in southeast Turkey], is meaningless, because that material, that stone is not the stone of this climate, there is no snow here or ice on floor. It is not effective and nice. In fact it is not pleasant visually. Even though it is cheap, there is the ethical aspect of this profession. Suggesting the use of such a material would be a gaffe for me.[13]

She later affirms that LEED had the role of indicating approval of what she was doing unconsciously. She maintains that "with LEED, I saw that I was doing several things correctly and gave me the idea of specializing in certain topics. LEED helped to raise awareness."[14]

New meaning LEED / Emergent Practice

LEED is seen to have a role in revealing these hidden design decisions and this consciousness reflects onto the definition of environmentally sensitive buildings by the architect: "What is important here is that the building has become a recyclable

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[11] Ibid.
[12] Ibid.
[13] Ibid.
[14] Ibid.

building. It is not important to have a label for this or not. We are doing something for nature."[15]

New knowledge LEED / Emergent Practice

The architect noted that before LEED spaces like photocopy room or space for recycle bins were not considered. She maintains that a list including these aspects directs designers towards right architecture, especially for those who do not consider them as part of their process.

Emergent Practice / Multi-disciplinary design team

When the architect compares her previous practices with the current one, she maintains that

> From the outset, it was a really pleasant process. You never work close with the other disciplines. What we do usually, we speak with them to explain the ongoing designs. We just have a couple of meetings to foster compliance in projects… In this project we were working on a subject together, providing solutions together without compromising aesthetical considerations.[16]

As mentioned above, the process benefits from knowledge gained from other disciplines, for example in optimizing the energy requirement against cooling and daylighting. The chain reaction, as referred by the architect, is seen to be central to this new practice. Even though the core of design process relies on optimization, networked knowing –explained to be one of the main imperatives of the ecological worldview– is seen to be attained.

6.2.3 EMERGENT PRACTICE VS. EXISTING REGIMES

In terms of the relationship of this case study practice with other regimes, one example seems to be important on this topic. LEED suggests using recycled material or reuse of materials. As seen from the project renders, the façades are planned to be made out of brick cladding. During the design phase with LEED, the architect informed the researcher that she received a call from the technical team working on site, who informed the architect that a factory building is about to be demolished just near the building. They asked if the architect would be interested in taking bricks from this building. She thought that it would wonderful to use such a cheap, reused, aesthetically appealing material. However the building owner directly rejects the idea. The architect claims that "this is a belief." is shaped by socio-cultural regimes. The study presumes that this building is supposed to be a prestigious building for the company, and reused bricks would not represent the prosperity. The belief of the owner, this taste and meaning, represents a constraining effect underpinned by socio-cultural regime.

There is actually another regime which clashes with this practice: material production regime in Turkey. However this relationship will be discussed for all the projects; therefore the discussion is left to the final section.

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[15] Ibid.
[16] Ibid.

6.2.4 EMERGENT PRACTICE VS. NEW WORLDVIEW

The knowledge gained from the practice with LEED is seen to be integrated into the architect's design process for future design processes. However in terms of the skills, we cannot state that LEED and its outcome IDP has generated the required shift in her practice, as her reference to right architectural design process is related with stabilized existing practices. LEED had the role of approving her background knowledge and skills in terms of material selection and building directions. There are certain aspects, like the attention paid to the lightening and ventilation, for which a relatively intensified process is explained to be followed by the architect. In fact one key point that the architect underlined for the normal/existing practice reveals her approach to future practices:

> All the other disciplines are bound to the work of architects. In fact the amount of detail they give depends on you, that is, how much you ask for it. If you don't ask for it, it remains very shallow. The capacity of the firm you are working with is again important. They also direct your design, but in such a business, if you say this is enough, you would get that amount. This is the result of human nature.[17]

Then for future projects, such an intense collaboration with engineers in terms of an integrated design process is not considered as an important aspect. She claims that if the architect puts the principles in advance, then the engineers would give the required information. However collaboration in advance and therefore networked knowing again stems from the designer's side. Again the architect is at the top of the network making the connections among professionals, but networking among other design collaborators and the possible emergent design solutions might not be attained.

While designing, it is seen that the concern of the architect is limited to the building scale; she does not consider what would be the contributions of the building to its place. Beyond the criteria defined in LEED, the practice does not reveal any other considerations in terms of sustainability. Flexibility in design, or in other words, the time dimension is not considered as part of design considerations. To summarize, the study argues that this practice remains in the mechanistic paradigm of designing, and this explains why LEED is considered only as a reminder of the architect's right architectural design decisions.

6.3 FRITERM FACTORY AND OFFICE BUILDINGS

6.3.1 PROJECT DETAILS

The case study project B, Friterm Factory and Office Buildings, is owned by a privately held company working in the AC and refrigeration market. The company is specialized in the production of finned type heat exchangers and focuses on the production of Air Cooled Condensers, Air Coolers, Dry Coolers, Water/Steam Air Heaters and Coolers, Oil Coolers and Heat Recovery Coils.

[17] Ibid.

Case study B will be the new factory building of this company, which is located in a new Organized Industrial Zone (OIZ), which is still under development process.[18] The OIZ was first established as a cooperative of 51 companies in 1996, and this area is included into the city master plan in 1998. The total area of OIZ is 5.100.000 m². Its 1/5000 development plan and 1/1000 implementary development plan is approved after a number of revisions required by industrial companies. The major infrastructure constructions started in 2006 and there are still huge numbers of factory constructions in this zone.

The architect of case study B, holding a bachelor degree in architecture, has an experience of more than 25 years in the field. The design of the case study B was initiated in 1996 and the first conceptual design was made in accord with the idea of implementing "green features," which will be explained below and which was presented to the client in 1998. However in this meeting the client asks for alterations in the overall conceptual design so as to have a more conventional factory building. Following this request, architect B again designs a new conceptual design. However she becomes unhappy about this design and during the second meeting, she refuses to design in line with the request of the client and tells them that she will not be able continue with them if they do not accept the concept underlying the first conceptual design, that is, 'approach to nature.'

Architect B feels that she has lost this job, but claims that "if we, architects, accept everything said by the client, we don't get the chance to change something, we have to be contentious."[19] Around 10 years later, the client calls back the architect with the intention to restart the project based on the first conceptual design and introduces the BREEAM assessor company to the architect. They form the multi-disciplinary team, including engineers who have no prior experience with BREEAM. To this end, over one year BREEAM Assessor Company gives lectures to the team about the assessment tool. Following these courses, a pre-assessment is made and then the assignment of project duties among the professionals is made based on assessment criteria. The process started at the end of 2010 and currently all the technical drawings of the project are finished and the construction is still ongoing. The project aims at receiving "excellent" rating.

The first conceptual design before BREEAM and the current status of the project after BREEAM is given below. Detailed technical drawings of the project after BREEAM are in Appendix 3. From the comparison of the two projects and based on the information given by the architect, it is seen that office block has passed over a major revision.

[18] Kocaeli - Gebze IV İstanbul Makine ve İmalat Sanayicileri Organize Sanayi Bölgesi, located in the Marmara region.
[19] Architect B, Interviews held with Architect of Friterm Factory, April-May-June, 2012.

Fig. 6-6: Friterm Factory and office block (First design, before BREEAM, southwest view)

Fig. 6-7: Friterm Factory and office block (First design, before BREEAM, southwest view)

Fig. 6-8: Friterm Factory and office block (First design, before BREEAM, northwest / southwest view)

Fig. 6-9: Friterm Factory and office block (First design, before BREEAM, northwest view)

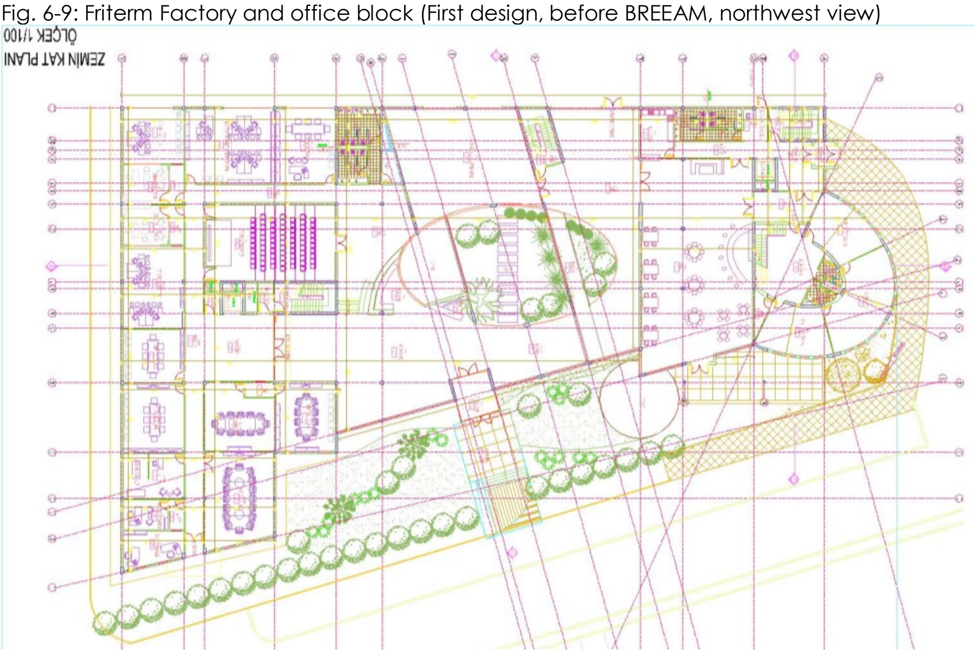

Fig. 6-10: Office block, ground floor plan (First design, before BREEAM)

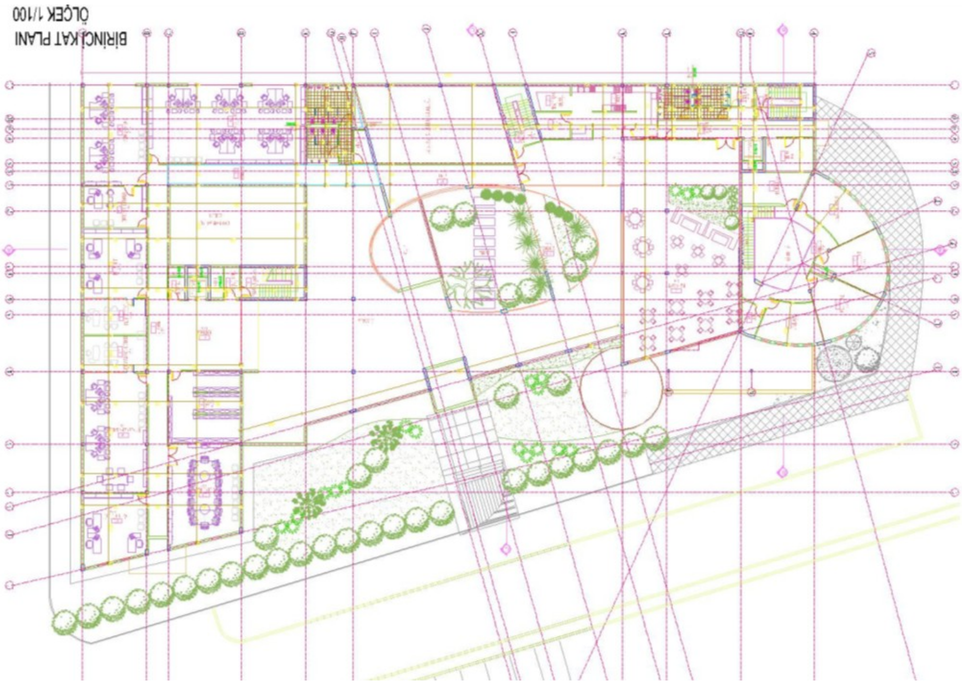

Fig. 6-11: Office block, 1st floor plan (First design, before BREEAM)

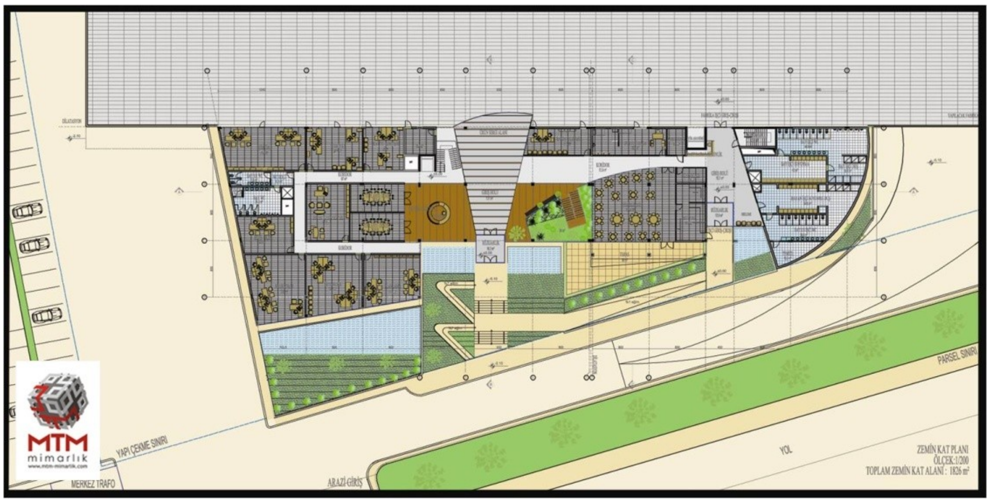

Fig. 6-12: Office blocks, ground floor plan (Design after BREEAM)

Fig. 6-13: Office block, 1st floor plan (Design after BREEAM)

Fig. 6-14: Friterm Factory and office block (Design after BREEAM, southwest view)

Fig. 6-15: Friterm Factory and office block (Design after BREEAM, top view)

Fig. 6-16: Friterm Factory and office block (Design after BREEAM, northwest / southwest view)

6.3.2 DESIGN PRACTICE WITH BREEAM

The following operational diagram is prepared based on the qualitative analysis of the data.

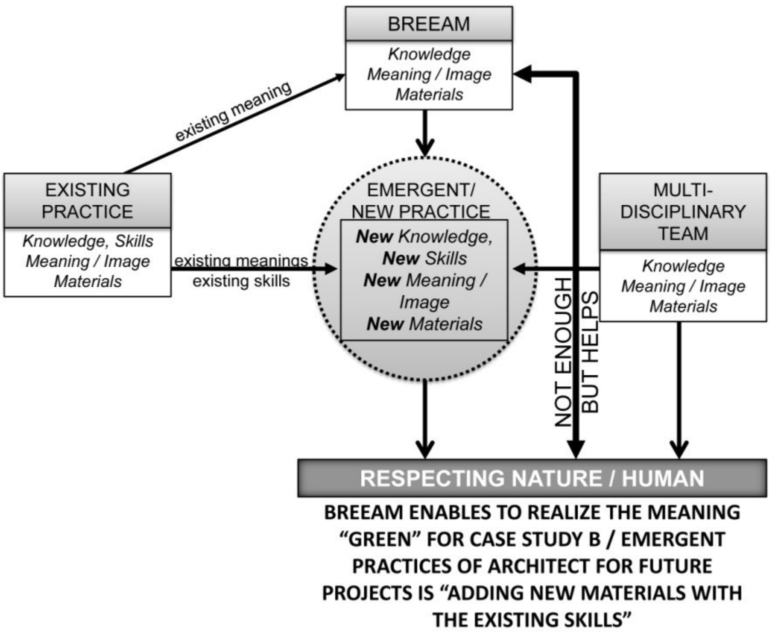

Fig. 6-17: Operational diagram of design practices for case study B

Existing practice (Meaning, Knowledge, Skills): Protection of Nature

One of the main concerns of the architect is the degradation of this natural landscape due to the construction of such a big factory building (38.000 m^2 in total). The speech of the architect, given at the second meeting held to discuss the second more conventional design, to object the requirements of the factory owner actually explains how this meaning, or concern, is translated into the architectural design based on her knowledge and skills. Again this speech is crucial for understanding the design of the building before BREEAM.

> In the building, functions are designed in a linear area, which symbolizes meeting, dispersion, invitation and the nature that is lost.
>
> Building is not dogmatic. It is designed along a cause effect relationship. In the building the stance of the employer with respect to the production and to the producers is accentuated with an axis that faces the entrance and goes along the production space. The building includes details of feminine forms as an attempt to honor women workers.
>
> Even though designing buildings, constructing buildings, climatization, and ventilation, all more or less include aspects that imitate nature, they are as well, ironically, creating the circumstances that destruct nature.
>
> This paradox, the use of natural materials (wood, plant, water, stone etc.) in the center of the building, is an apology of the architect to the nature that we are actually losing. For us, this represents a stance towards the project.
>
> A number of different design possibilities might be suggested for this project other than our philosophical and design approach. This project is our choice. The only thing that we cannot do is to design a building which is composed of the juxtaposition of the functions without any stance and thinking approach.
>
> It is after the acceptance of our ideas and opinions by the client that the architectural design will be continued and detailed.[20]

From this very short speech, it is possible to see that the architect has already an approach towards the protection of nature. She later claims that this was some kind of a dream. Her knowledge reflects as adding plants, water elements and using natural materials for wall and floor finishing. Another reason for using these materials in the office block is related to her decision about designing a space that supports the psychology of factory workers, who are working under a huge “bulk of steel.”[21] She claims that “when these people pass to the office building, they embrace nature.”[22] We might state that this is again a very literal and metaphorical approach. However if we look at this decision from another perspective, it indicates the meaning of social sustainability as well. Owing to the use of BREEAM, she explains how part of her dream turned into reality. These meanings are seen to have been effective on the uptake of BREEAM certification by the client. This means the architect re-framed the client’s perspective.

Multi-disciplinary team / Emergent practice

Compared to existing practice, the inclusion of a multi-disciplinary team is seen to have a considerable contribution to the design process:

> We had to change the project. We had to work together. And therefore we received a lot of feedback. For example we say we would like to do this, what is your opinion. You send the project to those working on heating, those working on ventilation, those working on acoustics. For lighting you send the project to the electrical engineer. Some of them say ok. Some of them say this

[20] The speech of Architect B in 1998 for defending the concept underlying the first conceptual design.
[21] Ibid.
[22] Ibid.

> would cause this problem, if you do this you have to change the material dimension. For example this process brought us some ‘no ways.’ No this is impossible for my discipline. For us, this process is very different, very unusual… It has changed our approach to building design. For all of us, it has raised awareness. Possibly, it has surfaced some considerations which were hidden before.[23]

Owing to this collaboration, it is seen that especially the office block has changed significantly. As was the case in the previous case study A, this process is like a chain reaction and it involves a networked knowing process. A holistic approach to designing is seen to be integrated into practice. In the architect’s words, “the office block turned into a building which can manage itself more efficiently.”[24] With the help of the new team, the knowledge gained from BREEAM has generated a new, emergent practice. Thus know-that is translated into a know-how.

Existing meaning, knowledge, skills (ventilation) / BREEAM / IDP

The architect showed her research made before BREEAM on ventilation possibilities for the factory building, because she was already aware that the ventilation of this huge space would bring a considerable cost. These researches are explained to be valuable for attaining BREEAM criteria on ventilation as well. Actually one of the existing meanings for the architect would probably bring an innovation credit for the project, that is, the psychology of workers. The factory building has a significant height, and the architect claims that workers would probably feel lost, pressed in this space. Therefore in order to support the psychology of workers they designed wall painting colors.

Existing skills / Existing material (CAD tools)

It is maintained that for this project as well, the design team still relies on Autodesk Autocad 2D software.

New meaning, aim / New skills, knowledge / IDP

For the factory block, BREEAM apparently introduced a new meaning, the acoustical comfort, to the team. Within the factory block, there are very noisy machines. BREEAM suggests enclosing noisy areas with sound protective materials, but considering the functions of these machines in the production phase, this enclosure is not possible. To gain the required level of comfort, the team had to reconsider the architectural design. They have developed a mechanism to hang sound catching panels from the ceiling. Currently the team is trying to render this hanging mechanism and the panel aesthetically appealing. The team expects to gain an innovation credit from this design solution.

There are a number of new aims, objectives introduced into the existing practice of architects. Herein the study will mention just a few of them.

> We have diminished the night time lightning. This is a new subject for us. Normally we try to make buildings shine all the night, add advertisement boards. We left doing those things…

[23] Ibid.
[24] Ibid.

> We were thinking that to become environmentalist, green, we have to plant grass everywhere. We learnt that this was not a right method. We learnt that we have to plant endemic plants, or plants which does not require so much watering.
> We used to make parking lots everywhere when possible. BREEAM does not definitely accept this. Instead we put bicycle parking lots, walking paths in the landscape. These aspects were not on our mind. For example waste disposal areas… Another aspect which was never thought before. Using grey water, using rain water; this has caused revisions in the project. Collecting the grease of vehicles, which are parked in the site, was an aspect that we never knew before.
> Pedestrian and cyclist safety: attaining this criterion was very difficult for us, because there are big trucks coming into building and we have to keep the safety of all the personnel and pedestrians.
> For ventilation, we had to add new roof windows, which were not thought before. These windows will be automatically operable. We analyzed different energy producing technologies; the current ones [solar and wind energy production] were not efficient for the building. We gained a lot of knowledge about mechanical installations and gained new awareness. We are happy about this […] We are happy about the revisions that the project has passed through.[25]

New materials / Emergent Practice

Energy simulations, as a new material for the team, enable the architect to reconsider especially the dimensions of the building, even how to open the windows. Another key concern was to use local materials, for which they had advantages as the site is located in one of the major material production zones in Turkey. In the past, the architect accounts that they were sometimes using materials imported from foreign countries with respect to their aesthetic appeal. BREEAM has changed this predilection for the architect, owing to the criteria that suggest using local materials to reduce CO_2 emissions caused by the transportation of these materials into site. Furthermore, they had to introduce new materials, new glass types and new color for wall paintings which, besides supporting the psychology of workers, would bring more daylight into working areas. Actually this aspect is considered as a good example for indicating the interdependencies among design decisions. These are explained to be new practices for architects.

Emergent practice (problems, point chasing)

The review of project meeting documents reveals that BREEAM checklist is influential on project objectives. There are notes such as “shall we try to achieve it” for a number of criteria. From the interview, it is seen that gaining credits has influenced design decisions and as explained in the literature this causes individual acts in designing. The expression “gaining credits” is immersed into the speech of both the architect and BREEAM assessor.

6.3.3 EMERGENT PRACTICE VS. EXISTING REGIMES

From the data, a number of examples where BREEAM certification of the case study B interacts with upper level regimes in the field of transportation and spatial planning emerge. Again material production regime in Turkey is explained to be one of the major problems that hamper the assessment process.

[25] Ibid.

Emergent practice / transportation regime

Case study B is located in a developing industrial zone detached from the main settlements. Therefore to gain credits from transportation criteria, the building owner had to speak with the administrative council of OIZ in order to develop a public transportation system.[26] BREEAM Assessor Company gave also a number of lectures about assessment tools. Instead of providing transportation for each factory through buses, the council decided to develop a public transportation system for this zone. This decision actually brings credits for case study B. Furthermore, BREEAM is explained to have triggered the idea of developing bicycle roads inside OIZ, but currently there is no such plan.

Emergent practice / housing planning, planning

Another regime level interaction is not actually totally related with BREEAM criteria. This OIZ is far away from major settlements; therefore workers have to travel long distances from their home to come the OIZ. BREEAM is seen to be influential in triggering council members to think about petrol consumption for transportation. After a couple of meetings, the council decided to speak with the Housing Development Administration of Turkey (TOKİ)[27] to construct a housing settlement near OIZ especially for workers. Finally the OIZ council with its 49 partners has established its own housing cooperative in order to respond to the housing requirement of OIZ workers. Actually we cannot directly relate this request to BREEAM; however it is explained that it has raised awareness.[28]

Emergent practice / waste management

During the process of assessment, case study B aimed to gain credits from waste management by developing an individual system. However the OIZ decided to construct a collective waste management, and then the credits will be automatically awarded to the building. This situation indicates the importance of conceiving not only the singular buildings but communities in developing plans.

Emergent practice / energy

Over the course of assessment, the team considered renewable energy generation from solar and wind energy. However this aspect did not seem to be an economical solution for case study B. Especially planting new wind tribunes, which can be used by all the factories located in OIZ, is explained to be still in discussion in council meetings. Currently this is not on the agenda of construction. These aspects indicate how collective actions might contribute to a systemic innovation at the upper scale.

Emergent practice / construction sector

Constructing in accord with BREEAM requires a number of new practices for constructors too. For example the control of construction waste and the control of trucks bringing material to the site have brought forth new practices that have

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[26] There is one key factor herein; the owner was also member of this council.
[27] Türkiye Toplu Konut İdaresi Başkanlığı (TOKİ) is the single responsible public body within the housing sector in Turkey. In chapter 5, it was noted that TOKİ is one of the main housing regimes in Turkey.
[28] Ibid.

never been of part of routine actions. The architect informed us that they had to ask constructors to check the exhaust controls of shipping vehicles and that they had to control the level of noise due to construction. This is again another point where BREEAM practice interacts with other practices.

Emergent practice / socio-cultural regime / nature
There are two sides of this regime: Design/construction side and the users' side. The architect reports that BREEAM awards credits for the reused materials, for example reused asphalt. She explained the difficulty in explaining the constructors this requirement. In contrast, especially people in the OIZ council were open to these new considerations brought about by BREEAM. For this case study B, the following phrase explains the effect of this building on the upper regimes as follows: "… there happened things that we haven't anticipated before; this building had an effect like a stone dropped into water creating rings around."[29]

From the users' perspective, the architect underlines one of the major problems stemming from the marketing strategy of these certified projects. Architect B explains this problem as follows:

> [Certified buildings] are introduced as very comfortable buildings. In reality this is a comfortable job. It does not bring comfort. On the contrary, this system asks you to reject several comforts. It says don't go everywhere with your car, go there by bicycle or walk. It says consume less, use old things. For example if you use an old door, if you go to a scrap-iron dealer, buy old door, paint it and use it in your building. These buildings are being marketed as if they were a luxury building. There is a contradiction in terms in Turkey.[30]

In the previous chapters the study touched upon this issue. Changing the lifestyle, and making it in accord with the time of nature is seen to be one of the main requirements to reach sustainable environments. Designers can provide these features, like bicycle use. However it remains up to the users in integrating these new materials into their daily life. Designs-in-practices were introduced in Chapter 4 in discussing how these buildings can become elements that trigger sustainable routines. A detailed discussion on this aspect is deferred until Chapter 7. Furthermore architect B underlines the following routine practices in Turkey:

> People have to change their mindset, which dictates them to consume new products and generate ever new wastes. In Europe it seems to be quite easy. They are bound to old, they have the culture to use old things; however in our country we have a culture that believes in demolishing the old and producing new. This is quite troublesome.[31]

Even though BREEAM or LEED award credits for brownfield developments or reused materials, structures, or recycled materials, these credits seems to be effective only if structural changes in the socio-cultural, planning and transportation regimes are attained. Therefore these credits are good incentives for affecting with some expectations, but their application calls for a socio-technical regime transition in Turkey.

[29] Ibid.
[30] Ibid.
[31] Ibid.

6.3.4 EMERGENT PRACTICE / NEW WORLDVIEW

The architect states that this is their first project with BREEAM. So probably in the second one, the architect maintains, they would know how to deal with its requirements. As mentioned above, the new knowledge gained from BREEAM, for example the use of gray water, which is considered as “a new trend” in Turkey, collection of grease from vehicles, local materials have started to be part of their new design agenda. However, these considerations especially, reflect as individual moves in designing. Even though the architect did not intentionally take design decisions that would contribute to the three poles of sustainability (but only to the protect nature and the occupants life inside these buildings), the building has triggered new expectations for this area. These contributions do not actually stem from the architectural design of the building, but from the requirements to get certain credits from BREEAM criteria. Then BREEAM has had contributions to this zone, and actually with respect to the scale of this zone, it might be argued that the regimes active on this area are not stabilized to structure to emergent niche practices.

In terms of criteria, we observe that the architect included a number of new considerations into design, like psychology of the workers, for which they will possibly earn innovation credits. The collaboration among design professionals, even though cannot be foreseen for future projects, has generated new know-how for architect B, who uses this knowledge in future projects.

6.4 TARSU SHOPPING CENTER

Case study C is a shopping center owned by a retail property company from Netherlands. The center is located in Tarsus, Mersin, which is found in a Mediterranean climate.

The study first gives a brief account about the owner company. The core business of this company, Corio N.V., “is to select, invest in, develop, redevelop and manage shopping centres in Europe.”[32] Its mission “is to create favourite meeting places: sustainable centres where people meet up, spend their time off, and shop; places they want to keep coming back to.”[33] With this ambition, Corio follows their Corporate Social Responsibility (CSR) Policy, which is explained to “enhance the competitiveness of the company, while advancing economic and social conditions in the communities in which [they] operate.”[34] This policy identifies several key strategies for attaining these objectives: Putting consumers first, rooted in society, leadership in culture, sustainability in operations, and creating sustainable centers. Based on this policy, sustainable centers are explained to be flexible, future-proof and viable. Corio aims at integrating “sustainability in the design and (re)

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[32] Corio, "Corio Company Official Website," http://www.corio-eu.com/home.html (accessed December 18, 2012).
[33] Ibid.
[34] Ibid.

development of its centres."[35] Following triple bottom line, that is, the balance between social, economical and economic quality in their words, Corio certify all their redevelopment projects with minimum 'Good' rating and the development projects with 'Very good.'[36] Case study C is a development project of the company and it is assessed with BREEAM with the intention to earn rating 'very good.' Discussing the strategy of the company is beyond the scope of this study; however there are various instances in which this approach is seen to have been influential in choosing the BREEAM credits.

While the conceptual design of the case study C is designed by an architectural design office from USA, its technical design is made by a Turkish architectural design office. The Turkish group of architects has an experience of around 20 years in the field. Both head architects of the office hold Ph.D. degrees in architecture. Especially, the Ph.D. thesis subject of one partner is on the historical development of ecological design in architecture with reference to the systemic approach in designing.

The analysis of this case is limited to the technical design phase, because the decision to certify the building is taken before the beginning of the technical design phase. Thus the whole process is managed in Turkey and BREEAM criteria were not part of the conceptual design process.[37] From the outset the architects C maintain that conceptual design is attained with respect to environmental design strategies, because Corio indicates in advance this requirement in project specifications. To this end, first the conceptual design will be explained briefly, and second the analysis of the practice with BREEAM, along with the repercussions of this process on the design team will be detailed.

6.4.1 PROJECT DETAILS: THE CONCEPTUAL DESIGN AND THE BUILDING PROGRAM

Being the first shopping center in the city center, project C is located within walking distance to the city center with a gross area of 63.000 m^2 and circa 10.000 m^2 of open public gardens surrounding the building. The building program includes shops, markets, cinema, food court, and entertainment center. "A place where water turns into joy" is defined by the foreign office as the major concept driving the conceptual design. The concept of "water" is explained to be chosen regarding the location of this city: "The relationship between the rich history of Tarsus and "water" is unique, the city was founded at the junction of the river coming down from Taurus Mountains and the port."[38]

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[35] Corio N.V., "Corporate Social Responsibility Policy," http://www.corio-eu.com/tl_files/content_resources/pdf/CSR%202012/CSR%20POLICY%202011.pdf (accessed December 19, 2012).
[36] Ada Shopping Center (BREEAM certified, category: in use, rating: Good), 365 Shopping Center (BREEAM certified, category: in use, rating: Good), Anatolium, Teras Park, Akmerkez, Tarsu, Tekira Shopping Center (category: in use, rating: Good)
[37] Architect C, Interviews held with Architects of Tarsu Shopping Mall, November-December, 2011.
[38] Yazgan Tasarım Mimarlık and Natali Toma, "Tarsu AVM, Tarsu Shopping Center," *Tasarım*, no. 209 (2011), 150-155.

Architect C claims that they did not as far as possible want to change the conceptual design, as they believe that this would not be an ethical approach, that is, changing another architect's project, or even further changing it in to conform the BREEAM criteria. Architect C claims "that the conceptual designer firm designed the building based on their artistic skills."[39] Design practices at this stage are full of meanings and metaphors; therefore while detailing these meanings developed in the conceptual project, the study does not fuse any interpretation intentionally.

If we look at how this concept reflects onto the project design, we see the artificial waterfall near the main entrance of shopping center and the pools with fountains located on the western side of the building. It is maintained that these fountains align linearly to the Adana Boulevard to transmit the energy of the water to the boulevard. The pool located at the heart of shopping mall is explained to represent the philosophy that considers water as its core element. Further explanation about the element of water is given as follows:

> As an artistic representation of the waterfall on the main entrance; glass crystals and water dance on the transparent ropes that reaches down from the roof light along the perimeter of the pool at the center of the double height activity area.[40]

Another concept driving the project design is explained as follows:

> Dating back to 3000 years ago, Tarsus is a city of layer with its rich history. Those historical, social, cultural, and urban layers contribute to the unique quality of the city. The main theme of the Tarsu Shopping Center follows this principle and it consists of 5 different layers from east to west. (1 Southeast: Stone corner, 2 Southwest: Waterfall, 3 Food Court Terraces: Green Zone; 4 Activity Areas: Water, 5 Chrystal Zones in intervals: Magic of Water and Light).[41]

In order to reflect diverse feelings and experiences for people, it is maintained that each zone is designed with different materials, ranging from natural stone and glass to wood. The building is defined to be in harmony with the Taurus Mountains and the city of Tarsus. The objective is explained as follows:

> Our aim is to create visual communication of the project on east-west axis and to create unity thanks to the circulation of various meeting points on the city scale. In this respect the layers of the project have such a design that the circulation first concentrates in the green Town square in the scale of the city and then carries on to the city center, a continuation of the same axis. As an extension of the same idea into the third dimension, gardens and terraces were created on the upper floor resembling works of art.[42]

The communication between the city of Tarsus and Tarsu shopping center is seen to be attained through the public square and the terraces opening to this square. The main theme "water elements" has an effective cooling effect for this Mediterranean city. The water spraying system is established in all of the terraces of Tarsu with a total area of 1.000 m^2.

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[39] Architect C, *Interviews Held with Architects of Tarsu Shopping Mall*
[40] Yazgan Tasarım Mimarlık and Toma, *Tarsu AVM, Tarsu Shopping Center*, 152.
[41] Ibid., 152
[42] Ibid., 152

Accounts on the design decisions related with green building considerations in the conceptual design phase underline that the building is designed with two floors in order to raise the density of the area, to reduce the surface covered by the building and therefore to leave space for public activities. However the study needs to make a possible inference herein. The study could not reach the municipality documents about the allowed construction area on this site. Therefore this decision may not be related directly to the consideration of a sustainable building, but the planning regime might have dictated this decision, as there might be an upper limit to the construction surface allowed on this lot.

Even though it is maintained that the conceptual design is designed based on environmentalist approach, from the above given explanations about the main theme, it becomes quite difficult to understand how these considerations are weaved into the design process. Buildings, especially the certified ones, are narrated as if they were detached from the main architectural design decisions. The focus on explanations on themes seems to underestimate design features, which have generated the space in terms of natural day lighting, cooling, and heating. Also this feature was not indicated during the interviews held with the architects. From Figure 6-23, we can see that windows strip put on top of the first floor shops enables to gain natural day lighting for common areas in the building. Again shops facing Adana Boulevard have transparent façades. Instead as will be seen from the interview, there is the tendency to consider green buildings as buildings with high quality green mechanical equipment. However it is seen that are a number of design decisions considered during the conceptual phase directly related with the reduction of energy demand.

Fig. 6-18: View from the public garden after the construction

Fig. 6-19: View from the public garden

Fig. 6-20: (Left) Main entrance from the Adana Boulevard
Fig. 6-21: (Right) TARSU Shopping Center

Fig. 6-22: TARSU Shopping Center

Fig. 6-23: Interior view from the ground floor

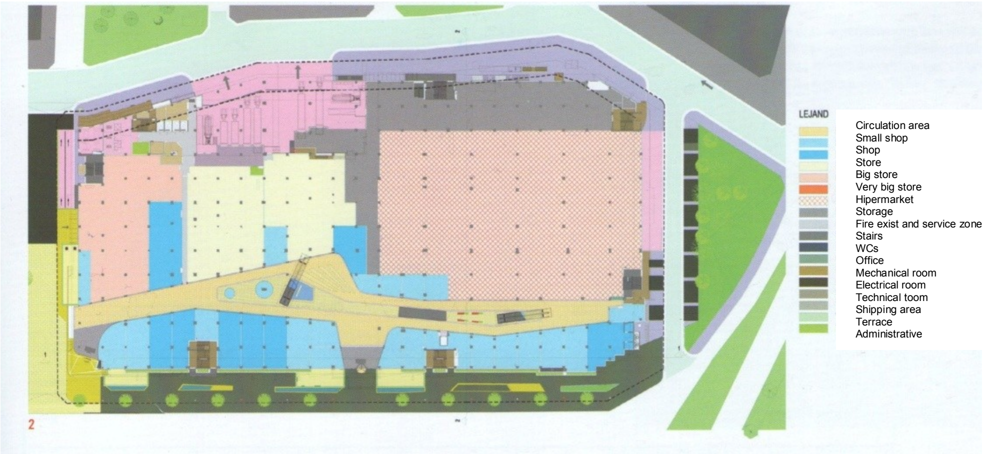

Fig. 6-24: Ground floor plan

Fig. 6-25: First floor plan

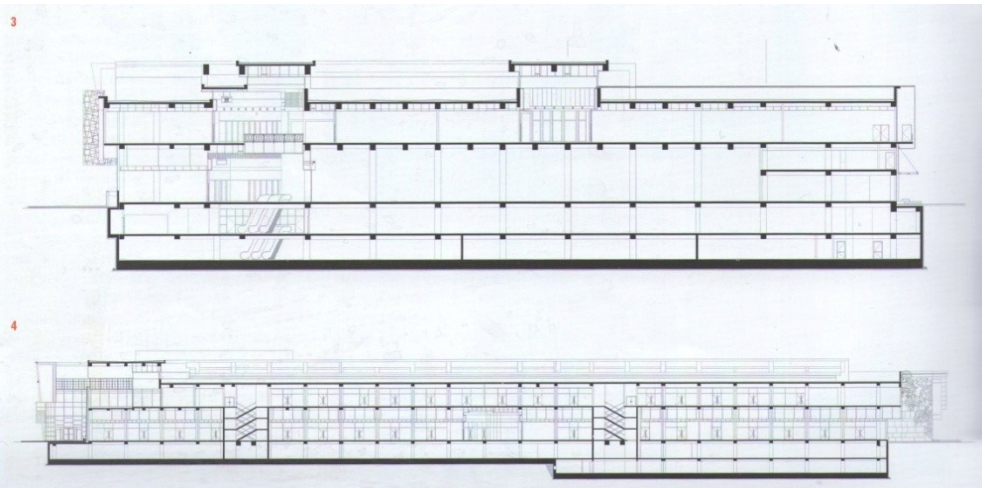

Fig. 6-26: Sections 1-1 (top) and 2-2 (bottom)

6.4.2 DESIGN PRACTICE WITH BREEAM

The study detailed the conceptual design above; however the main concern for this case study is to understand how BREEAM changed the design practices of the architects, who prepared the technical design projects of Tarsu, because meanings in terms of design considerations are already defined in this project.

After the decision to certify the building, the multi-disciplinary team was established. In contrast to the previous case studies, the intended rating is decided in advance. It was explained that the whole team first worked on the possible cost of reaching “very good” rating, along with the building information modeling of concept design.[43] Then the client put forth the cost that can be afforded and the intended criteria to be fulfilled were decided by the whole team. Due to the confidentiality of the detailed drawings of the project, the study can only account the design revisions based on BREEAM through the publications made by the architects C.

The major design decisions taken after this process are as follows:

1. Local materials are used in the project.
2. Tarsu is the first shopping center in Turkey that uses natural ventilation. Owing to the benefits of the conceptual design, it is possible to naturally ventilate 13.426m^2 of the building. In Tarsu, the system is not equipped with heating and cooling centrals. In order to balance the heat gain and loss, there are only four roof-top units, which are located in the atrium zone, and which circulate interior air either to heat or cool. This system is explained to be beneficial not only for the first implementation cost, but also for the building operational phase. In the project, big shops are equipped with fresh air units, with heat gain recovery systems. CO_2 sensors provide adequate air in case where needed. Moreover, insufficient cooling during the daytime is compensated by activating natural air conditioning in the free cooling mode at night. During the cool season, it is expected that natural air conditioning system will provide 15% saving in the whole center. During the hot season, 20% saving will be provided.
3. Parking lots are located in the basement floor to reduce heat island effect (Decision taken in the conceptual design).
4. Gray water (sinks, showers, etc.) meets 50% of the water requirements. The filtration and circulation system of pools reduces the water loss. For fountains and waterfalls to reduce the water loss due to evaporation, pumps are equipped with heat and wind sensors (WAT1 Water Consumption).
5. The automation system for lightings in common areas enables saving electrical energy. While during low season in summer 30% savings are foreseen, during the peak season in winter time 11% savings are expected. WCs and parking areas are also equipped with an automation system. Automation system of HVAC is expected to save 60% energy in low season and 40% in peak seasons.
6. Natural lighting enables saving energy. External lightings consume nearly 30kW of energy. Lightings are controlled with photocell sensors, with respect to manual

[43] Architect C, *Interviews Held with Architects of Tarsu Shopping Mall*

or time-based systems, around 1 hour is saved. Based on BREEAM criteria, LED and efficient armatures are preferred.
7. With respect to local standards of heat loss and gain calculations, wall and glass isolation systems are revised for 20% energy saving. Low E glasses are used (MAT1 Materials Specifications). In centrals normally EN 1886 Class L2 is sufficient, according to BREEAM Class L1 are used. The power of ventilators is taken as <1 W/lt/s. Impermeability class in air channels changed to EN 13 779 Class B. Insulation of the building is made 26% more energy efficient compared to local standards. According to the commissioning requirements of BREEAM, mechanical sub-contractors had to increase the overall profit; in a similar vein labor costs are increased.
8. Oil baffles are added to the entrance of waste tanks found in the parking areas.
9. Solar energy panels are used to provide hot water for showers, cafeterias etc.
10. Special areas are designed for containers of recyclable wastes.

A number of what is termed as "individual moves" by this study is seen to be listed in the publications as well:
1. HEA14 Glare Control: Window blinds are added to the office rooms.
2. ENE6/3 Building Fabric Performance & Avoidance of Air Infiltration: Under all the external doors, brushes are added.
3. ENE8 Lifts: Lifts are chosen according to BREEAM standards.
4. ENE9 Escalators and Travelling Walkways: Escalators and Travelling Walkways are chosen according to BREEAM standards.
5. LE6 Long Term Impact on Biodiversity: For landscaping, endemic plants are chosen.
6. MAT7 Designing for Robustness: Shin guards are added to the laminated doors. Preventive applications are taken to protect wall and column corners.
7. TRA2 Cyclist Facilities (1): Bicycle parking lots are designed and provided with glass shelters.
TRA3 Cyclist Facilities (2): For workers driving with bicycle, changing rooms with showers are designed.
8. TRA6 Travel Information Point: On the info desk, an information screen indicating the public transportation schedule is designed.
9. WAT6 Irrigation Systems: For watering landscape, drip irrigation system is chosen. Rain and wind sensors are added.
10. WST4 Compactor/Baler: Bale press machine is added according to BREEAM standards.

Now, the study turns to the design practices of architects working on the project in order to reveal what practice with BREEAM meant for them. The figure 6-27 is prepared based on the analysis of the interviews with the architect C (one of the partners of the architectural design office).

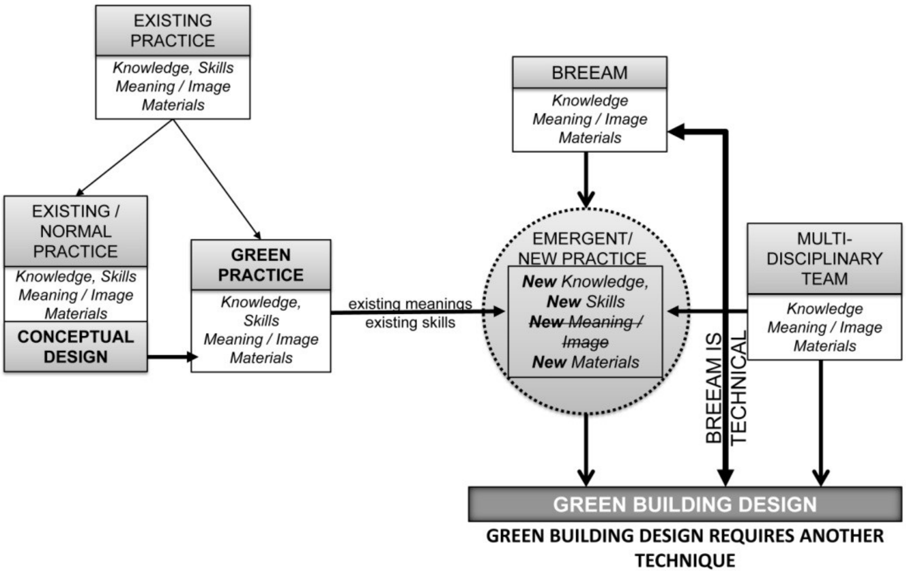

Fig. 6-27: Operational diagram of design practices for case study C

Existing meaning (Green vs. normal building)

Compared to previous case studies, there is an accent put on the difference between green and normal practices by the architect C. The architect C underlines that practices with BREEAM can only be involved starting from the technical design phase.

> You do not work according to the tools during the concept design phase. In the concept phase, the main design decisions are indicated. The assessment is made according to these decisions during the technical design phase.
>
> […] the concept designer uses his artistic skills in designing. The assessment process starts after the conceptual phase. […] To receive the rating, there are certain criteria that must be met. This is something related with the technical design phase… Because, let's say you want to have green roof, you have to solve the problems, but you solve them during the technical design phase. Even if the concept designer designs a green garden, he does not design it to receive BREEAM certificate. He designs it according to his approach and then during the technical design phase you work for attaining the label.[44]

According to her approach, green building design mainly involves electro-mechanical design decisions that cannot be taken during the conceptual phase.

> The conceptual designer does not consider the electro-mechanical design. The designer does not say if I design this part like this I would be able to place the machines, I haven't yet seen an architect thinking in this way in conceptual design. That means [the conceptual designer] does not think in an engineering manner, hence s/he designs more like artfully.[45]

The requirements of BREEAM are considered to be solely as technical requirements, which can be solved during the technical design phase. Compared to the previous case studies, it is quite striking that BREEAM is not conceived as a tool for improving the design knowledge and skills of the architects.

[44] Ibid.
[45] Ibid.

In case study C, the architects paid special attention to follow the conceptual design by respecting the design of conceptual designer. They explain the reason for this decision as follows:

> We didn't change the conceptual design. We respect the design. It is not ethical, because [the conceptual designer] has artistic skills… Think of Zaha Hadid's projects. Let's say if you change the sloping of the façade, it would become green. What is important in technical design is to enable the construction of the same design, because the project is an artistic whole… For example, these buildings, like shopping centers have a certain typology, they have a certain floor height. This is the reason why the client hired this conceptual designer, because they already have experiences in these types of buildings. [The conceptual designer] does not design according to the dimensions of green technical equipment.[46]

Furthermore, in their belief designing and constructing green buildings is costly compared to normal practice:

> Because for a green building, it is not just [architectural] design that matters you need more engineering solutions, that is, you have to collaborate with engineers to produce solutions. I may say it is more important, because for natural ventilation, heating if they are going to be designed according to BREEAM that is another subject… Ecological or eco-friendly buildings have a different electro-mechanical system compared to normal buildings. Because you have the increase of cost in these building, varying from 2% to 25%. Making a green building is costly. These systems are not normal systems, they bring extra cost. If you're going to build green you buy something different, if not another thing.[47]

Existing skills / Existing material (CAD tools)

Similar to the previous case studies, this project as well uses Autodesk Autocad 2D software. It explained that the project controller firm checks whether the collaboration among projects is attained correctly. They have to check each project: Architectural, civil engineering project, mechanical project… They also have to check whether the quantity surveys are calculated with respect to the project. This process is very similar to existing practice.

Emergent practice / Multi-disciplinary team

Architects C underline the importance of having worked with multi-disciplinary team, without which it would be impossible for them to design these systems, which require a networked communication. To explain a number of design instances, the architect actually refers to the chain reaction, as mentioned above, among project decisions. They state that:

> For example, to design the pools the mechanical engineer worked with the pool producer firm to discuss the filtration of water, but they also had to inform us, as we are producing the technical details… BREEAM enables integrated design process. The mechanical engineer asks something to us, we then call the electrical engineer…[48]

Compared to the normal practice of this architectural office, having weekly meetings with the other design professionals was not a new phenomenon. Nevertheless, it is maintained that the main difference in these meetings is the rise

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[46] Ibid.
[47] Ibid.
[48] Ibid.

in the number of people involved in meetings. In “normal” projects, there is always dialogue among these professionals, but the architects C state that

> When a project is green, human ecology, human resources are used efficiently during the design process as well. Because everyone involved in the project get in touch with each other… Ecologist, material suppliers, project manager, BREEAM assessor… In usual practice there is a dialogue, but in a one-to-one format. In this practice we might say there are the multiple dialogues among people. When it is a green project, you learn something from material supplier, then you call the ecologist. Multiple dialogues among multiple persons…
>
> This enables using human resources more efficiently… I will explain you this based on my thesis work. Within ecosystems this is a similar phenomenon. First you put the frogs inside and then the plants. For a while they consume a lot of or extra energy to adapt to the place. Afterwards there come the insects or other type of plants. When the number of species augments, the energy percent consumed by each member reduces. This is what is called biological diversity. Like human diversity. As is the case in biological diversity, you use your energy more efficiently.

The study already referred to the importance of socio-cultural diversity in attaining resilient communities. Herein actually the study observes that this new integrated design process has not only generated an environment for learning, but also a working environment in which people do not waste their time solving problems individually; they collaborate to achieve solutions. Networked knowing is seen to be related with human diversity and efficient energy use in designing as well.

Emergent / New knowledge
Architects C claim that this was their first experience with BREEAM. The multi-disciplinary working environment, by including all the parties interested in the project, enabled them to get new knowledge about ‘green’ equipment. Also, it was their first time working with an ecologist in the project, which has feed their knowledge in this field as well.

6.4.3 EMERGENT PRACTICE VS. EXISTING REGIMES

In case study C, except for the material production regimes, the study did not find a constraining or enabling effect of the project design practices. However, the architect C indicates how, possibly, socio-technical regimes and also a “niche” practice might constrain the proliferation of practices with BREEAM.

Emergent practice / socio-cultural “niche”
Architect C explains that there are certain people who consider these tools as part of a capitalist system. The architect claims that:

> Most people think that these tools are used for economic purposes, for marketing… I am against this approach, because when you reach this decision, the subject matter is environmental appropriateness. Are there any disadvantages here? No. it is even better… BREEAM have improved my knowledge a lot…

Similar to the previous case study B, architect C as well foresees benefits in improving their knowledge.

Emerging practice / Socio-technical meaning

Architect C underlines one of the major barriers in attaining 'green buildings' and realizing the same conceptual design not only in the technical design, but also in the construction phase of projects in Turkey, that is, socio-cultural meanings circulating in the socio-technical system.

> In this project, the client paid attention to ensure that the technical design of the project followed line by line the conceptual design. European clients are more sensitive, in this respect, I mean culturally. If they were to escape from these costs, they would not have asked for such a project. However in Turkey, constructors or developers believe that they can change projects at will. I believe that in Turkey, people have enough capital, but somehow they don't want to use them. They want to reduce the time spent in construction phase. For example they change the production details, selected materials. One less one more, it does not matter for them. There is always this approach to construction in our country. Following the conceptual design line by line is a cultural problem. Even though there is a change in concept, as BREEAM is more technical, there is a solution for respecting BREEAM.[49]

Architect C underlines here a problem in the socio-cultural regime in Turkey. Constructors or developers on a number of occasions change project details, especially to reduce project costs. Probably in projects with BREEAM this would not be possible, as the technical design projects should be strictly followed during the construction in order to be awarded with the intended rating.

In previous case studies, we observe that the architects had the role of reframing the perspective of clients in raising awareness about assessment tools; however the main important actor who is actually in charge of costs is the clients. In this sense, architect C underlines that it is usually difficult to find clients who ask for an ecological building from the outset. Then the demand side is still seen to remain low.

6.4.4 EMERGENT PRACTICE / NEW WORLDVIEW

The study reveals that architect C considered BREEAM only as a technical process that can be achieved through collaboration with a multi-disciplinary team. Architect C underlines that the conceptual design is the outcome of the artistic skills of the designer. However decisions taken early in the design process is known to enhance buildings in terms of sustainability. Then relating BREEAM practice only to technical design stage might be problematic; it might undermine the beneficial aspects BREEAM would have had on conceptual design. From the overall analysis of this case, the study concludes that their future practices would mean first design and then assess or make it green.

6.5 AK PLAZA OFFICE BUILDING

Case Study D is an office building of 49.000 m^2 located in a very dense neighborhood in the European part of İstanbul and it is in the certification process with BREEAM. With respect to the deep interest of the architectural design office of

[49] Actually herein again the architect predominantly sees BREEAM as a technical problem solving.

the building in designing sustainably, before delving into the analysis of this project, the study accounts the background of the architectural firm.

6.5.1 ARCHITECTS' BACKGROUND

The architectural design office is run by two partners, Aytaç and Ali Manço. The second partner, Ali Manço, who joined the office ten years ago, has a deep interest in environmentally sensitive building design, holds a masters diploma in project management and is a LEED Green Associate. He publishes articles about sustainability in a local newspaper. He claims that his interest, and actually sensitivity, is seen to be one of main drivers of their design decision making process.

Ali Manço states that this interest stems from his education at the masters level, which has enlightened him on these issues. In the following years, he maintains that he went on doing more research in this field on his own, and he wanted to prove this knowledge by earning the LEED GA degree, even though he thinks that some of his colleagues despise this certificate. According to his belief, "those who internalized the real principles of architecture and objectives would naturally follow [the concept of sustainability, or "green design, or environmentally sensitive design]."[50]

Even though he maintains a disbelief in BEATs, he articulates that the professional working environment pushes you to prove and thus certify your sensitivity to certain issues. He states that "certain principles cannot be disseminated without using some kind of templates."[51] Therefore he attributes a special role to these tools; he considers each step towards the dissemination of this concept as a useful step in such a narrow-sighted and turbulent sector. He further adds that "based on the current consciousness of average building sector, it is a prerequisite for green buildings to attain marketing value through labels. Owners [or developers] do not unfortunately get convinced through other mechanisms."[52]

The study shares the following excerpt from an interview held with the architect, because his ideas are actually very much in parallel with the ecological worldview:

> The design itself is underestimated in current discourse. Because the issue I most appreciate is sustainability. "Green" and "ecologic" are secondary concepts. There is no building, which can be beneficial to environment. When you construct a building, it consumes energy, you damage nature. It is not possible at present to stop construction on this world. Therefore if we look at the issue from another perspective, you realize that the important thing is to use these buildings as long as long possible. Green building in its simplest form is to sustain a building.[53]

Therefore buildings should transcend centuries. Instead of focusing only to the efficiency side of designing, the ecological worldview maintains that the building

[50] Ali Manço cited in Seda Kayım, "Ayın Konusu : Manço Mimarlık, Interview with Manço Mimarlık," http://www.mimarizm.com/CatKapi/Detay.aspx?id=63&BultenID=62 (accessed August, 15, 2012).
[51] Ali Manço cited in Ibid.
[52] Ali Manço cited in Ibid.
[53] Ali Manço cited in Ibid.

must contribute to their environment and they must be the outcome of technologies adapted into the peculiarity of the place. So in a nutshell the following principles are explained to be keys for architects towards sustainability:

1. Whether the building responds to the local socio-economic requirements
2. The location of the building in the city
3. Whether building components are designed only with aesthetical consideration or energy efficiency
4. The real contribution of technological systems
5. The flexibility of the building according to new functions
6. The influence of the building to the local area
7. Whether the building materials and systems are attained from local sources.[54]

He underlines that "however much a building strives for becoming "green," only internalized and protected buildings are those that are sustainable."[55] Then, buildings have to make people happy, for being recruited into inhabitants' practices as materials. Furthermore, they have to be designed to have a level of flexibility to fulfill future functions. In terms of energy efficiency, he suggests first following passive methods:

> In reality the most intelligent buildings are foolish buildings. In other words, intelligent buildings are those which reduce energy consumption and fulfill the human comfort level without being equipped with complex technological systems. This is because technological equipment requires maintenance and even further hampers the possibility of attaining flexibility in buildings.[56]

They underline that sustainability should be conceived with all its perspectives. Therefore it is not possible to consider architects as the master designer; they have to collaborate with other professionals, as in the case of integrated design process. In chapter 2, the study referred to the difference between the concepts of identity and unity. Herein the study observes that these architects, in order to respond to the place, put an accent on this issue:

> Trying to gain passive precautions, that is, wind, sun, natural slope, and out of these elements finding the ultimate form. In brief, we believe that designs should be drawn from the context… Instead of a project, from the first look you say these are the buildings of Aytaç Manço and Ali Manço, we try to design projects that are peculiar to a place and to a program. An important addition to these considerations is ecological or green design principles.[57]

6.5.2 PROJECT DETAILS

The site of Case Study D of is located in one of the urban regeneration areas. The building is designed to serve as offices for different companies. The project design process started with the hiring of architects by the developer, who is the owner of the site. During the brief, the developer did not have a specific idea about what to build in terms of function on this site, but their preliminary decision was to build a shopping mall. Through the collaboration of the architects, the developer and the real estate counselors, it was decided to have an office building in this zone. To

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[54] These principles are defined in Ali Manço, "Mimarlık Ve Çevre," *Yeşil Dünya Gazetesi*, no. 4-5 (.
[55] Ibid.
[56] Architect 1 cited in Devrim Bozkurt, "Tasarım Bilgi Üzerine Kurulmalıdır, Interview with Ali Manço," *BEST*, no. 113 (2010), 34.
[57] Ali Manço and Aytaç Manço cited in Aytaç Manço and Ali Manço, "Interview with Aytaç Manço and Ali Manço," *Duvar, Knauf*, no. 35 (2009), 15.

reach this decision, the architects maintain that they had to consider the following questions:

> What are the development possibilities of the city? In which direction and in how much time will the surrounding environment [neighborhood] develop?[58]

Not only specifically for this project, but also for other projects, the architects explain that they usually reframe or guide the decision of constructors or developers about building types.

The building has 15 floors in total (5 underground floors, one under ground floor, one upper ground floor, 7 normal floors, and roof floor). The total construction area is 49.276 m^2 (usable area 30.394 m^2, parking area 12.721 m^2). The building capacity is 2500 persons. The architects informed us that they did their best with the available technology to reduce the energy demand of the building. PV panels on the roof generate the electricity energy for lightings of underground parking lot. The building is equipped with heat gain VRV systems for HVAC systems.[59] To reduce the consumption of water, water efficient fixtures are preferred. Lighting fits inside and outside the building are controlled with building automation system. Building materials are chosen from local producers, in line with recyclable content or recycled content. Other features of the buildings are: Rain water collection and storage, space for storing recycle refutes, place for charging electrical cars in the underground parking, banking ATMs, control of HVAC systems in different units. It is not possible to indicate the influence of BREEAM in the uptake of these systems; however in terms of materials the above given systems are line with BREEAM and also LEED criteria. The prior knowledge of the architects and their design approach actually supports the integration of these technological improvements after making the necessary architectural design decisions. As of December 2012, this building is still in under construction and the intended rating is “very good” as a core & shell building.

Fig. 6-28: AKPLAZA, Aerial view[60]

[58] Ali Manço and Aytaç Manço cited in "Dosya: Çevreye Duyarlı Ekolojik yapılarInterview with Ali Tokmakoğlu, Aytaç Manço and Ali Manço," *İNDERgi*, no. 16 (2008), 58.
[59] Aylin Muhaddisoğlu, "Dolapdere, Kentsel Dönüşümün Dikkat Çekici Bölgelerinden..." *Stone Concept*, no. 2 (2011), 60-62.
[60] Image taken from AKPLAZA Piyalepaşa, "AKPLAZA Görseller," http://www.akplaza.com.tr/tr/imagesprojects.php (accessed December, 19, 2012).

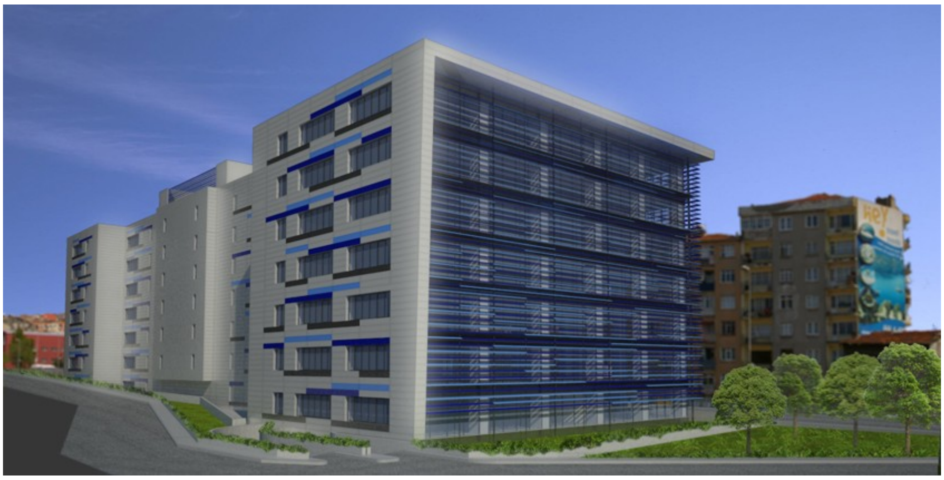

Fig. 6-29: AKPLAZA, Southwest view[61]

Fig. 6-30: AKPLAZA, Southeast view[62]

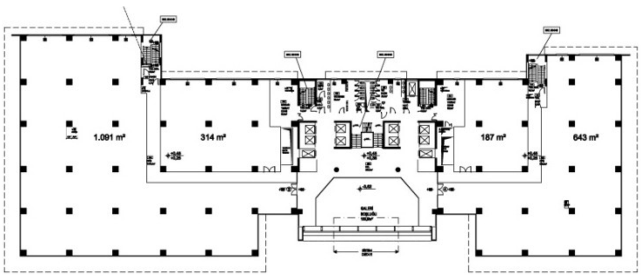

Fig. 6-31: AKPLAZA, Ground floor plan[63]

[61] Image taken from Ibid.
[62] Image taken from Ibid.
[63] Image taken from Ibid.

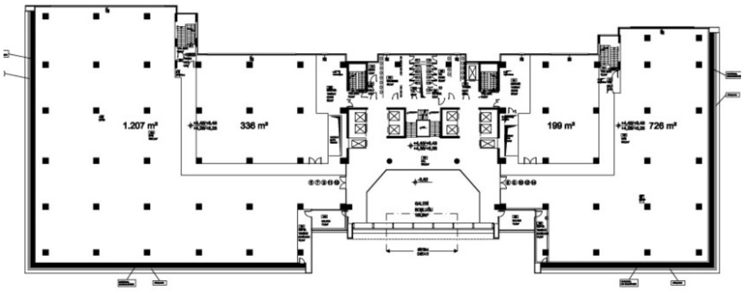

Fig. 6-32: AKPLAZA, Floor plans (1st-7th floors)[64]

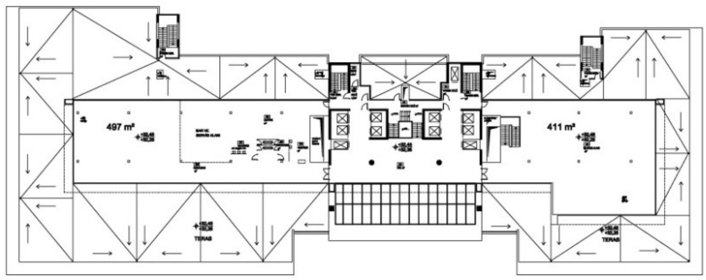

Fig. 6-33: AKPLAZA, Roof floor plan[65]

6.5.3 PRACTICE WITH BREEAM

The following operational diagram is prepared for case study D.

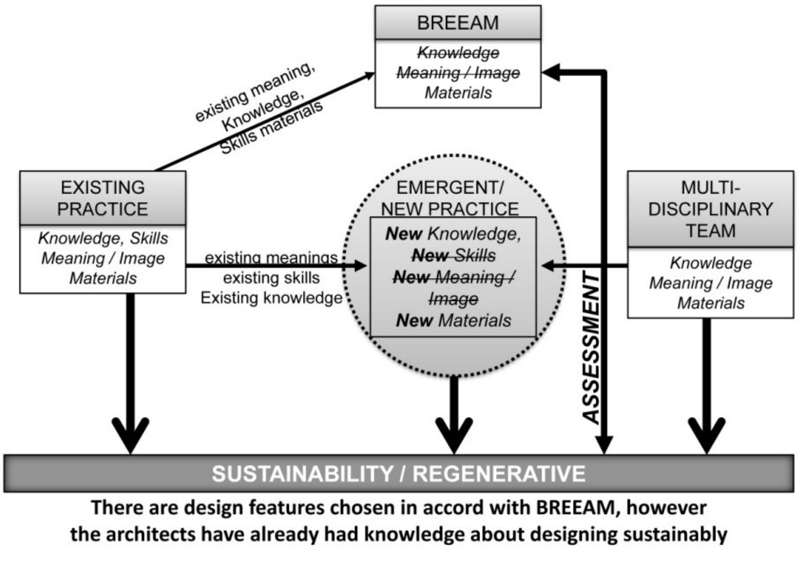

Fig. 6-34: Operational diagram of design practices for case study D

Existing practice (knowledge, meaning, material)

Based on their objectives (small and big offices for companies), the preliminary design included two office blocks with one service core block. Following their etudes, they decided to have a building which acts like a dominant building with

[64] Image taken from Ibid.
[65] Image taken from Ibid.

respect to its environment, which is currently in an unfavorable condition. Hence the decision is to have an exemplary building for this neighborhood. They underline that the first image of such a building that usually comes to people's mind is a building surrounded by thick security walls that dissects the building from the surroundings. Instead they decided to establish a smooth connection between the building and its surrounding by designing a park in front of the building. The service or circulation block is designed as a much as possible as a transparent space, which would be a breathing space, a meeting point for office occupants. It is not possible to see the interiors of office blocks from the outside, but the service block or common areas through its transparency are visually connected to its surroundings. The main image of the architects in their design practice is seen to be a building, which besides being fully connected to its environment and which is well appreciated by the community and shown as an exemplary building, stimulates other developers in terms of this image –therefore a building that enriches its environment.

While designing these blocks, the architects maintain that due to municipal plans and the building site, it was not so much possible for the architects to alter the location of blocks on site, in accord with solar positions. Instead they designed the building façades according to sun positions, the climate, and sight. In this sense, while the western façade facing the slums is majorly opaque, the northern, southern and eastern façades are open but are equipped with sun shades, which are designed from dense (southern) to scarce (northern).[66] The architects explain that they chose to cover the opaque walls with prefabricated sandwich panels, regarding its easiness for montage and maintenance, good insulation level. Besides this material alludes to the old building, which was a metal melting facility.[67] Sun shades are placed away from façades, just for a person to walk, and are connected at each level with walkways, so they can also serve as railings. The architect informs us that there won't be any need of cranes or catwalks for cleaning façades.[68] The decision to make a green roof is explained to be related with several reasons. First, by placing the green area, which was not possible to do on the ground, it will protect the ecological equilibrium, reduce the heat island effect, enhance heat and sound insulation. Second it will create a recreation place. Third this building is usually perceived from top view, so covering the roof with green would prevent its perception as an ugly box.[69] The architects claim that there are certain decisions that they can take on their own, and they state that after these decisions, the engineers are integrated into the design process.

In this project, even though the main architectural design decisions are taken before, the integration of engineers, the architects underline, will allow attaining a more integrated design process for future projects.

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[66] Ali Manço and Aytaç Manço cited in *Dosya: Çevreye Duyarlı Ekolojik yapılarInterview with Ali Tokmakoğlu, Aytaç Manço and Ali Manço*, 56-59.
[67] Muhaddisoğlu, *Dolapdere, Kentsel Dönüşümün Dikkat Çekici Bölgelerinden...*, 62.
[68] Aytaç Manço cited in "Bir Mimar; Ve Cephe, Aytaç Manço," *Çatı Ve Cephe* 5, no. 28 (2010), 30.
[69] Ali Manço and Aytaç Manço cited in *Dosya: Çevreye Duyarlı Ekolojik yapılarInterview with Ali Tokmakoğlu, Aytaç Manço and Ali Manço*, 59.

6.5.4 EMERGENT PRACTICE VS. EXISTING REGIMES

The study did not come across a specific niche-regime interaction in this project. However, it is crucial here, to bring a major problematic in the Turkish context into discussion: The choice of building function. In Chapter 4, the study indicated that rules, active on the formation of socio-technical systems or regimes, structure practices-as-performances, and for the built environment regulative rules, like material standards and planning regulations for the urban scale, have a deep impact on the design practices. The Turkish legislation on the development of plans (spatial) includes the following objectives: To generate a healthy physical environment that fosters the communities' well-being, along with the protection of natural environment, to direct investments for the proper choice of site and development trends. In the same legislation the development plan is defined as follows:

> This document is prepared in accord with the researches and data on the economic, demographic, social, cultural, historical, and physical aspects of towns and aims to fulfill the socio-cultural requirement of the town, to generate a healthy and secure environment, raise the life quality and develop alternative solutions for development trends and includes details about the use of land, decisions on protection and limitation, principles of implementation.[70]

These plans include decisions about the function of plots and aims at reaching a balance housing, industry, agriculture, tourism and transportation. However these plans are also subject to change over the years, with respect to new developments in cities and towns. There is a certain procedure that must be followed for requesting these changes. From this case study project, we observe that the initial decision of building a shopping mall here is altered by the architects. So it seems that the planning decisions do not have an impact on these decisions. As mentioned before, sustainability in built environment cannot be attained by designing individually sustainable buildings. The diversity in function, thus responding to the exigencies of the place and the relationships between these buildings is explained to have a deep impact on this issue.

6.5.5 EMERGENT PRACTICE / NEW WORLDVIEW

The existing practice of this architectural design office has already had meanings, knowledge and skills related to sustainability in architecture. At the building scale, the primary design moves in the process are based on passive design strategies. If these decisions are not enough to fulfill the energy demand of the building, the architects maintain that they start looking for mechanical improvements and they are well aware of the need to integrate engineers in advance.

In terms of scale, the architects envisioned what would be the possible development of the surrounding area and in fact this vision guided even the choice of the function of the building. Notably, this study considers this decision as one of the main contribution of architects' existing practice to the sustainability of the building and therefore the city. BREEAM does not award credits for the selection of

[70] http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=7.5.4880&MevzuatIliski=0&sourceXmlSearch=

the building function with respect to the place. Again the decisions to integrate the green area to the surrounding and the idea of constructing 'a representative building' for this neighborhood is considered as crucial decisions for a sustainable built environment. They wanted to challenge the meaning or objectives of the upcoming developers or owners to this area. Besides making economic revenue to the developer, the focus is on the exigencies of the local area by making essential contributions to this area. Furthermore, with respect to the attention paid to the flexibility in the building design and to the future development trends of this area, the project decisions are taken for longer time scales, in fact these decisions are developed with the support of BREEAM criteria.

As explained above, their practice represents a robust approach to social, economic, and environmental sustainability of this project. Most of the design decisions depend on the existing practice of architects. Then BREEAM criteria are seen to be effective only on the material choice, lighting and water fixtures. The study argues that their practice can be considered in line with whole/living systems worldview. In this sense, BREEAM is used with respect to its original objective, assessment of project, as an approval of design decisions.

6.6 35. SOKAK HOUSING PROJECT

6.6.1 PROJECT DETAILS

Case Study E, 35. Sokak (Sokak: Street) Housing Estate Project, includes 555 low-rise residential buildings. Located in İzmir, the estate will gather around 2000 habitants. There are six different house types in the project, varying from 81m^2 to 272m^2. The construction is still going on and it is expected to be finished by the end of December 2013. While the total construction area of houses and upper floors are 78.649m^2, the underground parking area, which is made of reinforced concrete, is 35.200m^2. The total site area is 130.000 m^2. The building is assessed against BREEAM International Bespoke 2010.

İzmir has a typical Mediterranean climate, with really hot summers and high humidity levels (it borders the Aegean Sea), and mild winters. One of the main problems in terms of energy consumption of buildings in this region is seen to be the cooling. The development site is located on one of the major development areas of the city; however it is a suburb of İzmir and it will be connected with a new subway line to the city center in the near future.

The project developer of case study E is a company specialized in lightweight steel frame construction; therefore the building structure is seen to be decided in advance and this aspect is critical in terms of sustainability for a number of reasons: Nearly 90% of steel can be recycled in this type of steel frame after demolition; the construction of steel frame can be easy and fast compared to reinforced-concrete structure; these frames have only one type; it is easy to control construction costs; lightweight steel frame has a higher performance in terms of earthquakes.[71]

6.6.2 EXISTING PRACTICE VS. EMERGENT PRACTICE[72]

The operational diagram that explains the relationship between the existing and the emergent practices is given below:

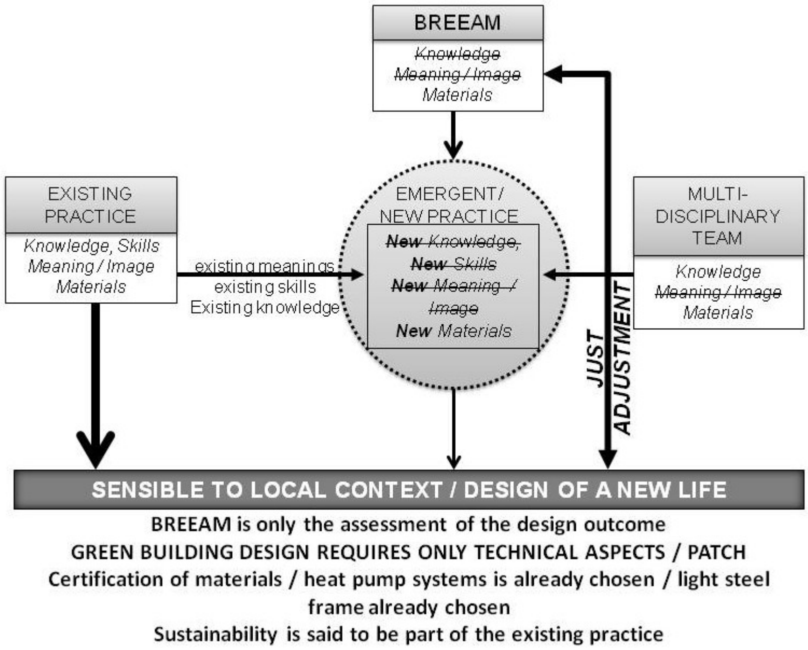

Fig. 6-35: Operational diagram of design practices for case study E

Existing practice (knowledge, material, skills)

The architect draws our attention to one of the main problems in these development projects in Turkey, that is, the problem of gated communities. In Turkey, gated communities are designed as if they were detached from the surrounding area without any, especially social, connection among each other. The buildings are usually designed only for particular lots, without foreseeing connections to the surrounding developments. Again in Turkey, urban design of these development areas are not well planned to include green areas among the development lots. The architect foresees that the site of case study E will be a community of gated communities of real estate, which will represent such an urban characteristic outlined above in the coming future. Therefore instead of diffusing houses along the land boundaries, he focuses on opening green areas along this huge area and they put a “line” of 2km on the layout plan. A line is actually a metaphorical connotation; however it neatly defines the line on which houses,

[71] İzmir is in the first degree earthquake zone in Turkey.
[72] The study benefits from a video recording of the meeting held with one of the partners of architectural design office, who explains the overall design approach for the project. This meeting is held on the site and after the meeting the invitees makes a trip to the building construction area. The meeting video can be found on *Arkiv Buluşmaları 23: 35. Sokak, Arkiv Buluşmaları 23: 35. Sokak,* (İzmir: 2012)

parking lots, streets, and social components on the angles are found (sport center, cafés, restaurants, markets).

The design of the layout plan of the development includes another design decision as well. The land has at least 30m of height difference from north to south and it does not have a homogeneous slope; there are small hills as well. Usually in this type of land, the architect states that architects usually place the buildings and that supporting walls are used to control the land. Instead of supporting walls, the foundations of houses, made of reinforced concrete, are thought to serve as barriers to control land. Even further, regarding their intention to get rid of car traffic, it was possible through this layout to put all the traffic, including the parking lots underground. This decision again leaves the upper floor, therefore the total landscape with green area. This major line on the layout is explained to solve all these intentions with one design solution. The following figures, first layout plan and the section of the line are seen to be at the heart of the project.

Fig. 6-36: Case study E, Layout view[73]

Fig. 6-37: Case study E, Section of the line[74]

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[73] Figure taken from Akşan Yapı, "35. Sokak," http://www.architizer.com/en_us/projects/view/35_sokak/18448/#.UOjUIG_tTCk (accessed December ,18, 2012).
[74] Figure taken from Ibid.

Fig. 6-38: Case study E, Section of the line[75]

Fig. 6-39: Case study E, Photo from the construction site[76]

Designing houses side by side and placing the street in-between these houses is again a decision related to the intention to generate a real community with good neighbor relationships. Again this idea reflects onto the six types of houses, which have the kitchen looking to the street and the living areas looking to the green areas. From the summary of these design decisions, the study observes that these decisions are totally related with social and economic sustainability principles. The design decisions are not confined to the development site; they are the outcome of seminal determinations about the future urban development of this area. Again with one design solution, material use is reduced as well, because it solves the parking requirement, the supporting wall, the foundation of houses, the required infrastructure.

Emergent practice (knowledge, materials) / BREEAM

In order to reduce the consumption of energy the building is equipped with air-to-water heat pump system that provides heating, cooling and hot water heating for domestic use is provided by solar collectors.[77] PV panels of 350kW will generate

[75] Figure taken from Ibid.

[76] Image taken from 35. Sokak, "35. Inşaat Inşaat Ve Maket Fotoğrafları," http://www.otuzbesincisokak.com/kesfedin/insaat_maket_fotograflari.html (accessed December, 17, 2012).

[77] Meltem Bayraktar, Ece Kalaycıoğlu and Zerrin Yılmaz, "A Real-Life Experience of using Dynamic Building Simulation for Building Environmental Performance Assessment in Turkey" (Sydney, Australia,

the required electricity energy for social facilities and the common areas. Gray water system is implemented in the project for watering landscape.

Architects' approach to BREEAM

The following except is taken from the architect's response to the question of the role of BREEAM in their design process.

> [BREEAM] is something that is detached from the building. [BREEAM] is not something that can be internalized by us, architects, because we eventually try to design buildings to be environmentally sensitive and intelligent. However this concept is like a yard stick. Thereby when you think about this, you have to complete a lot of things, such as putting recycle bins, materials used, the distance to the subway, how it will be commissioned, heating and ventilating. Heating and ventilation of course there are important issues, here we have air-to-water heat pump, which does not make as cold as out split air-condition, but these units both heats and cools the buildings and regarding its COP, which is higher compared to boilers working on natural gas, we decided to use this system. It is a little bit more sensitive system.[78]

Actually the architect is seen to be very critical about these tools, because in an article the architectural design office further maintains that

> BREEAM process is very technical. To tell the truth, while these tools focus on where the plywood materials are bought and what the origin of these materials is, it is astonishing that they do not take into account the benefits or the drawbacks of architectural design approach. Probably this is because assessing architectural design approach is not something that is countable. For us [BREEAM] introduced some detail into the process. Work load and documentation are increased […] The main work load is on mechanical and electrical engineers and on the construction process.[79]

From the onset, the study considers this critique based on the premises of this project as an accurate determination. Because according to whole/living systems paradigm, solving the problems of local place is seen to be critical rather than focusing solely on the efficiency side of the problem.

6.6.3 EMERGENT PRACTICE VS. EXISTING REGIMES

Except for the material selections, BREEAM criteria did not flourish a niche-regime interaction. The study argues that the planning decisions taken by the architects represent a practice and planning regime interaction. As maintained by architect E, usually in Turkey these types of housing developments are planned without respecting their connection to the urbanscape.

6.6.4 EMERGENT PRACTICE / NEW WORLDVIEW

The architects envisioned what would be the possible development of the surrounding area and in fact this possible envision is seen to guide decision decisions on the layout plan, which does not put boundaries between adjacent

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12th Conference of International Building Performance Simulation Association, November, 14-16, 2011).

[78] *Arkiv Buluşmaları 23: 35. Sokak*; Bayraktar, Kalaycıoğlu and Yılmaz, *A Real-Life Experience of using Dynamic Building Simulation for Building Environmental Performance Assessment in Turkey*, 2836-2842.

[79] "35. Sokak," *XXI Mimarlık, Tasarım, Mekan*, no. Special Issue: XXI Yeşil Binalar Referans Rehberi (2012), 33.

sites for making possible connections to the surrounding area. Therefore these decisions, on which BREEAM does not have an influence, are not taken within the building *scale*. BREEAM does not award credits for these decisions. With reference to the vision about the development trend of this area, the project decisions are taken for longer *timeframes*. Building structures, which are decided in advance, also underlines the importance of conceiving the lifetime of these buildings.

As explained above, social and economic sustainability is part of the design decisions. Again these aspects are not considered with respect to BREEAM criteria. It seems that the project has only drawn knowledge about reducing the energy demand of the buildings. For example, the house types do not change with respect to the direction of the façades. This is an important drawback of this project and the inclusion of BREEAM seems not to have changed this decision. Furthermore, the architect explains that sun shading devices are not intentionally included, as they believe that occupants over their life in these building will decide which type of shading will be used in these buildings. Therefore, they only equip the windows with a detail that enables the adjustment of shadings. Thus in terms of time aspect, the project enables flexibility. They believe that such a simple white façade will be colored by people and this would have a good effect. Here lies a significant question mark: The building energy simulation is made according to building without shadings, but the designs-in-practice will change over the use phase.

The emergent practice is actually in line with their existing practice; therefore BREEAM did not yield new considerations. Especially, the concept of 'line' and the respect to urban scale is considered by this study as elements representative of networked thinking. However the design solution to reduce energy demand of the buildings is considered as a technological fix.

6.7 TURKISH CONTRACTORS ASSOCIATION[80] HEADQUARTERS

Located in Ankara, the capital of Turkey, case study F will be the new headquarters building for the Turkish Contractor's Association (TMB). The project is the first prize winner of the limited invited design competition opened by TMB. Before delving into the project details, it is beneficial to look into the first architect's, Selçuk Avcı's, approach to sustainability owing to its close relationship to the principles of theregenerative paradigm.

6.7.1 ARCHITECTS' APPROACH TO SUSTAINABILITY IN ARCHITECTURE

Selçuk Avcı states that to attain sustainable solutions in architecture, they are following what they call 3E, three concepts: Ethical, ecological, and economical. By

[80]Türkiye Müteahhitler Birliği

ethical, he means values that establish our relationship to the community, to other humans, cultures, ethical consumption and different lifestyles.[81] He maintains that

> This is our response to 'Genuis Loci' or the characteristics of 'place.' According to this definition, all our actions must be ethical or in other words sensitive to the local community, culture and place.[82]

When the architect is asked about his first starting point in designing, he states, "the most important beginning for me is the understanding of people for whom I am designing and the ideals and ideas that they are pursuing through our design."[83]

Ecology, or Earth, is conceived as the organism that supports us. Therefore he urges protecting the symbiotic relationship with Earth. To do so, he underlines that the core of designing should consist of actions that reduce our detrimental effects. By economics he means "the equity, our investment and the validity of buildings we built on earth."[84] He underlines that we are living in a closed system.Therefore actions performed based on the approach of 'win-win' would continue to yield harmful effects, because in this approach it is for sure that for someone to win, someone else has to lose. Actually he is referring to the time dimension crucial based on theecological worldview.He argues that "our decision must be valid for the long-term and [that] we should make long-lasting investments to sustain the future generations."[85] By comparing buildings to humans, he articulates that:

> We are all free people. So in a similar vein, buildings are different from each other with respect to their site, geography, and climate. The implementation of 3E principles enables respecting these differences.[86]

Actually he defines in a nutshell what it would mean to design in a regenerative paradigm. His approach to the design process reflects this as well. To attain sustainable buildings, he suggests pursuing a multi-disciplinary and integrated design process starting from the project brief. This process might include material producers, dealers, constructors and the owners as well. He compares the architect to a maestro, who conducts a number of different instruments harmonically. Furthermore, he underlines that the time allocated for design process should be enough to enable innovation and go beyond the limits.[87]
Avcı underlines that he has been practicing architecture in line with this understanding ever since that he graduated from University of Bath, where this approach to integrated design process is fostered through a special curriculum. He explains that:

> both architecture and engineering students are taught in the same classroom for two years. After that the topics get more detailed, and the students are

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[81]Selçuk Avcı, "Sürdürülebilirlik: Nasıl Mümkün?" *XXI Mimarlık, Tasarım, Mekan*, no. November (2011), 39.
[82]Ibid.
[83]Avcı cited in Zeliha Heval Yüksel, "Selçuk Avcı, Interview on His most Recent Projects," *Türkiye Seramik Federasyonu Dergisi, Journal of Turkish Ceramic Federation*, no. 40 (2012), 58-76.
[84]Avcı, *Sürdürülebilirlik: Nasıl Mümkün?*, 39.
[85]Ibid.
[86]Ibid.
[87]Avcı in Ibid.

> separated. However for the final project to achieve an integrated design, they work togetheragain.[88]

In order to understand his practice with LEED, the study shares the following list prepared by Avcı, detailing what he calls eco-sustainability issues.We observe that each item corresponds to criteria defined in BEATs.

- Objectives for low CO_2 emission
- Implementing low carbon energy sources
- Gathering and producing energy on site
- Designing for minimum energy demand
- Intending to reduce AC use
- Maximizing the daylight inside the building
- Ensuring the recycling of heat generated inside the building
- Not using non recyclable material
- Obtaining materials from sustainable resources
- Using natural materials rather than synthetic ones
- Reducing the waste generated over the construction phase
- Not using materials that would heal the ozone layer, CFC and HCFC
- Taking into consideration the detrimental effects of the production or waste of building materials[89]

He underlines that as each project is situated in different places, all these items cannot be attained by each project.

6.7.2 PROJECT DETAILS

The architectural program of the building in case F includes offices, an exhibition hall on the ground floor, and a multi-functional hall (for dining, meetings, and conferences). The design of the building respects the major characteristic of the institution, “which is often home to an intense range of both national and international activities and in which high-level dignitaries coming from all over the worldare often hosted.”[90]

It is maintained that by respecting the allowed limits for construction on site, the project goes beyond the limits of adjacent housings on Doğukent Avenue, and leaves a green area as a public space in front of the building, which is integrated to the green buffer located along the avenue. This allows the building to get immersed into the urbanscape. The exhibition hall, located on the ground floor, with its transparent glass façade and the central atrium that connects the upper floors actually extends this public space into the building, as well as acting as the foyer of the multi-functional hall. The atrium enables the visual connection between floors, by also respecting the privacy of the management area on the third floor and the lounge on the attic, finished with a glass roof.

Ankara has a typical continental climate, with cold winters and hot and for the last 10 years slightly humid summers. So concrete is chosen as the main structure frame “because it is a “thermally” heavy material and retains both coolness and

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[88] Yılmazer, *Sürdürülebilirlik Anlayışı Kalem Daha Kağıda Değmeden Ortaya Konulmalı, Interview with Selçuk Avcı*

[89] Ibid.

[90] Yüksel, *Selçuk Avcı, Interview on His most Recent Projects*, 58-76.

heat."[91]The façades of the building respect the privacy of upper floors and use a very special façade cladding that enables not only this privacy but also shading. It is designed after the traditional architectural elements used mostly in Arab and Middle East countries and called "musarabiye" or "kafes" (meshwork) in Ottoman times. This shading tested by specific energy modeling, minimizes heat gain, and thus helps to reduce the sizing of cooling equipment. The architect further adds that "the mass construction […] with thick stone walls […] retains both coolness and warmth when willfully and intentionally stored."[92]Furthermore, the glass topped central atrium enables natural ventilation controlled by automated louvers at the top. Return air at the top of the atrium is also "passed through heat retention devices to minimize heat loss through ventilation."[93] On the roof terrace, pergolas are used to minimize heat gains and there are also solar hot water panels and photovoltaic panels.

What distinguishes this building is a passive cooling and heating system developed for the first time in Turkey. There are considerable temperature differences between day and night times in Ankara. In order to reduce the energy demand of the building for heating and cooling "a below ground labyrinth of concrete walls, which acts like the below ground Byzantine cisterns"[94] are used. Avcı says,

> the example that we originally used when we thought about the Labyrinth was not the Byzantine Cistern, but the Roman Hypocaust systems which were developed to heat buildings. This idea was first put forward in a research project when we were invited to design an energy efficient laboratory in Italy, where we thought about "natural air-conditioning". It was further developed by our engineers from London, Atelier Ten, in to a cooling system, and applied successfully in both the UK, and Australia. We used the example of the Byzantine cistern to illustrate the idea to CNN in an obvious way, where a similar space could be found in Istanbul.[95]

In summer nights, the concrete labyrinth constructed below the lowest car park level is cooled through the cool air passing inside the labyrinth, which becomes like a cooling store. During the day, the outside hot air passes through the labyrinth. Owing to the cool massive concrete, heat is released. This preconditioned air is then sent to building. The air passes through the pipes inside concrete slabs to reach chilled beams and the air is released into the spaces. Chilled beams help to condition the air if there is further need of heating or cooling.[96] The labyrinth works also in wintertime, at an average ground temperature of Ankara (6-12 degrees). This means it is usually hot compared to outside temperatures ranging from -15 to -1 ^{o}C. In wintertime, the labyrinth helps warm the air infiltrated from the outside before it is sent to the mechanical rooms. It is maintained that:

> This cycle makes it possible to seasonally reduce the cooling / heating load of the building, thereby reducing energy consumption. This also provides for the

[91]Avcı cited in Ibid.
[92]Avcı cited in Ibid.
[93]Ibid.
[94]Avcı cited in Ibid.
[95]Avcı cited in Ibid., 61
[96]"Türkiye Müteahhitler Birliği," *XXI Mimarlık, Tasarım, Mekan*, no. Special Issue: XXI Yeşil Binalar Referans Rehberi (2012), 68-69.

> possibility of reducing the sizes of the mechanical equipment and therefore the plant rooms necessary for the whole building.[97]

Beyond of these design innovations, it seen that the building will be equipped with "LED lighting, low water consumption sanitary equipment, rain water storage, gray water recycling, and similar eco sensitive approaches."[98] Similar to previous case study projects, for the landscape, planting are chosen from local endemic species that require low watering, and when possible local materials are chosen. LEED platinum rating is expected to be received for this building.

Fig. 6-40: Case study F

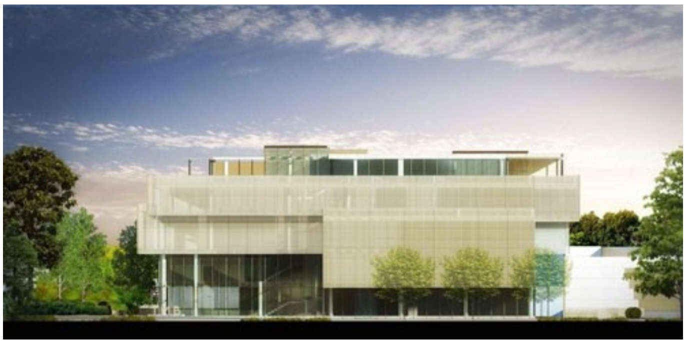

Fig. 6-41: Case study F

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[97]Yüksel, *Selçuk Avcı, Interview on His most Recent Projects*, 58-76.
[98]Ibid.

Fig. 6-42: Case study F

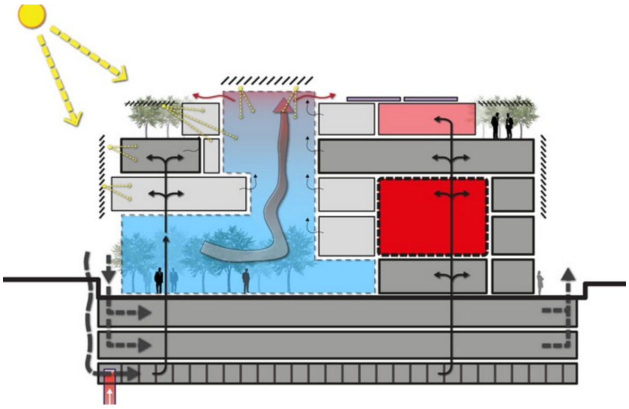
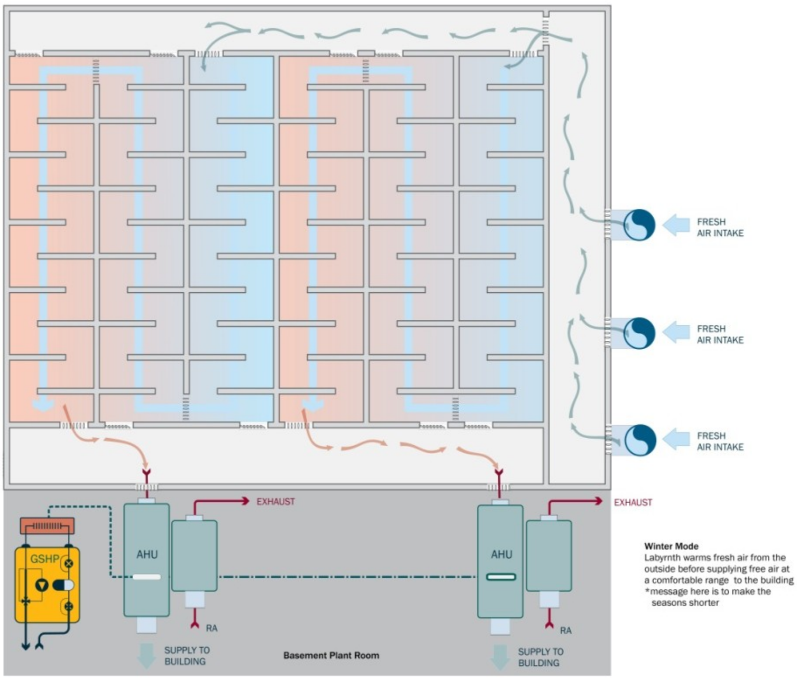


Fig. 6-43: Section of the case study project F[99]



[99] Image taken from http://www.avciarchitects.com/en/projects/detail/tmb_headquarters/

Fig. 6-44: Figure representing the winter mode of the labyrinth[100]

6.7.3 PRACTICE WITH LEED, EXISTING PRACTICE, NEW WORLDVIEW

Even though the author tried to get in touch with the architect, it has not been possible to receive a response for a meeting. It was thus not possible to understand how the practice with LEED had implications on the existing practice from direct sources. However, the review on his interviews, his publications on the website of architectural design office, and his previous project reveal that sustainability has been a prime concern in Avcı’s projects long before this project and thattheir office has been following such an integrated holistic approach. So LEED or BREEAM area ‘material’ recruited to their existing practices. Thestudy presents the following operation diagram based on his existing practice. The diagram also includes what might be the role of LEED in it. In this model themulti-disciplinary working environment always brings forth new approaches and thus innovations to the process and the product.

The major reason for including this case into the study is that the architect’s approach to designing demarcates a similar approach to the regenerative paradigm and this practice is explained to be rooted in his university education. Furthermore, the design of the labyrinth is considered as a radical innovation in the present study because its design calls for not only the integration of mechanical engineers but also the knowledge gained over the course of architectural culture. It represents a holistic approach to the knowledge recruited in the architectural practice.

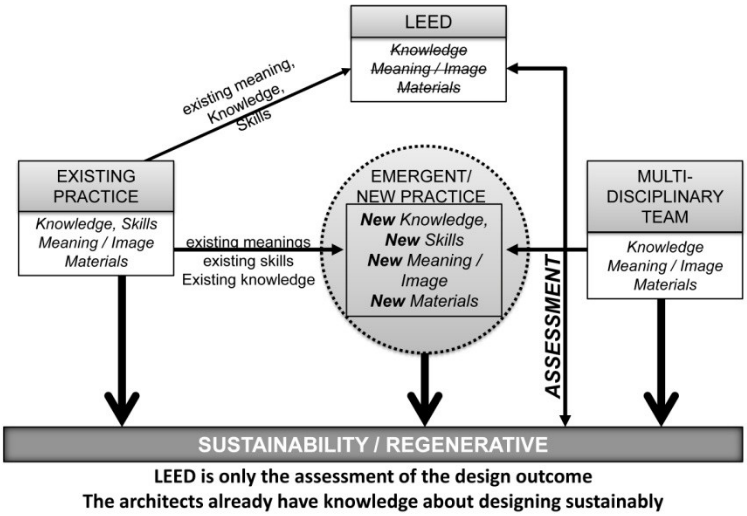


Fig. 6-45: The operational diagram of case study F

100 Image taken from http://test.avciarchitects.com/wp-content/uploads/2012/10/LbrynthDiagram_WinterMode_20101207.jpg

6.8 SIMILAR PATTERNS IN CASE STUDY PROJECTS

By referring to the critiques on BEATs introduced in Chapter 3, the study will discuss the similar patterns in design practices of these case study projects, along with the impacts of regime/niche and niche/niche interactions observed in these projects. The meaning of design practices with BEATs and the level of innovations of these practices, as a key for regime transitions, will be discussed in Chapter 7, which will integrate all the regime-niche interactions revealed throughout the case studies.

6.8.1 DESIGN MOVES IN THE PROCESS

From the review of these projects, the study observes that there are a number of common design moves in these practices:

1. Select local material
2. Select certified material
3. Select water efficient fixtures
4. Select efficient lightings
5. Reduce night time lightings
6. Spare space for electrical cars or car sharing
7. Efficient HVAC systems
8. Spare space for recycle bins
9. Use endemic plants, which does not require too much watering, in the landscape

The disconnection of environmental criteria is explained to hamper holistic approach to designing. Owing to the multi-disciplinary working environment, it is observed that one objective, like reducing the energy, has been reflected into other design decisions, for example to landscape design in case study A. The architects define this aspect as a chain reaction. It is true that we might able to see a chain reaction in a number of criteria.

In contrast, there are individual moves, too. For example in case study B, acoustical comfort is solved in a closed loop. It did not interact with the solutions for rendering the energy efficiency of the building. Again in case study B, pedestrian safety is explained to cause major problems for site planning. However that was never a question to change the building design. For example, in case study B it is maintained that the criteria MAN 12: Life Cycle Cost Analysis of the project cannot be intended, because this criterion is conceived in the conceptual design phase. Actually the cost of the building is a major concern for the client, and so the economic sustainability of the development is not assessed.

This problem seems to pertain to case study C as well, as the assessment process started after the compilation of conceptual design. Case study C does not change the conceptual design and this is an intentional decision. Then the design moves only pertain to fulfillment of criteria indicated in BREEAM. Actually the multi-disciplinary team is explained to be related to the problem solving of technical design. For case study E, the air-to-water heat pump system for ventilation is also considered as an individual move, since the design itself does not enhance more passive solutions.

6.8.2 MULTI-DISCIPLINARY DESIGN TEAMS

Integrated design process is suggested as a sine qua non for attaining sustainability in design. It is maintained that the buildings should be considered as a system or a whole, rather than isolated parts. By including all the parties, this process prepares the ground for networked knowing between professionals. Even though BEATs are criticized for not showing this integrity in the evaluation schemes, the case studies integrated multi-disciplinary teams as an essential part of the practices with BEATs for a number of case studies.

The criteria in BEATs, as mentioned before, give only component knowledge about what needs to be considered in the process. Therefore they do give “know-that,” but not “know-how.” Know-how is generated over the team work and it is this knowledge that differs from existing practices of architects. It is maintained by architects that in previous practices they used to send the project to engineers just to include the required HVAC systems, and they did not work on the conceptual design phase. They only know that they have to prepare spaces for HVAC systems or learn somehow the dimensions of isolation materials. Actually in the existing practices, the study argues that architects were to some extent passive learners of the work done by engineers. They do not interact with the process, which fulfills the energy requirements of their buildings.

Multi-disciplinary design teams formed in case studies is explained to generate a learning environment, especially in case studies A, B, C, and F. In order to optimize the energy requirement of the project, architects A and B underline that they have to find solutions together. For example in case study B, a new meaning of acoustical comfort as well as a new component knowledge are introduced, and the team had to solve the problem in collaboration. In this case people involved in the process are seen to have had a constructive mode of learning; they learnt it by doing. Architect C underlines that this working environment, while distributing the project objectives into stakeholders, enables the deployment of human energy efficiently.

6.8.3 INCLUSION OF STAKEHOLDERS IN THE PROCESS / DESIGNS-IN-PRACTICE

The study starting from the first phrase of this thesis underlined the importance of changing our lifestyle for aligning human time with nature’s time. In this sense, the study suggested the inclusion of all the stakeholders in the design process. This goes beyond the inclusion of the client, and means the inclusion of workers or office inhabitants. Because they will use these buildings, these buildings should become elements of their practices, which would hopefully trigger sustainable practices.

In case study A and B it is seen that the owners have been part of integrated design process when needed. However they did not have a role in defining the intended thermal comfort, or there were no meetings with occupants to discuss what they might relinquish for the sake of reducing energy. In fact, this inclusion correlates as well with socio-cultural regimes of inhabitants. BEATs suggest new materials to be included in the everyday practices, such as the control of thermal comfort and lighting in different zones. Occupants sharing the same space should be informed about their contribution to nature. However the project only provides these control switches and BEATs therefore remain only as practices-in-design for architects. Their transformation into designs-in-practices has to be enforced by designers.

From another perspective, even though the owner of case study A is included in the process, his socio-cultural regime infuses the image of new materials that must form his new office building. So he does not change this image for the sake of nature. The criteria in BEATs are not compulsory, so they do not dictate people to change these aspects. Their building A might gain a high rating, Platinum, because the building uses renewable energy, but the project might not exhibit the same sensitivity in material choices.

In case study C, the client remains only as the paying mechanism. Even the conceptual design is made by a foreign firm. The study does not believe that sustainability can be the outcome of architects who do not have any idea about the social contexts for which they are designing.

It is observed that these projects continue producing a number of existing daily life practices. The buildings are equipped with elevators. Case study C also includes escalators, which are chosen according the BREEAM standards. The study argues that building design should also consider the use of stairways, not only because of energy, but for reasons of health as well. Escalators or elevators are elements of unsustainable practices. BEATs does not change this type of practices; it only enhances an incremental approach, not radical ones. This problem does not actually pertain only to these cases; in fact it encompasses all the certified projects.

6.8.4 CRITERIA / SCALE/ REGIMES

Chapter 3 indicated that criteria in BEATs are limited with the assessment of individual buildings. In contrast Chapter 4 suggested that even though the assessment might remain in the building scale, this process might interact with other regimes in the socio-technical regime of built environment. It is maintained above that other regime levels might have constraining or enabling effects on practices.

Case study B had an effect over the planning decisions of the industrial zone by leading OIZ managers to develop a public transportation plan for the area. In Chapter 5, the study discussed the problems in spatial planning in Turkey; in fact the problem is that there is no planning in a sense. One key problem in these examples pertains to the credits related with the location of the site. For none of these projects, was the site selected based on environmental contamination or closeness to public transport. In fact, in the case of Akplaza, even though the site was already chosen, the function was altered by the architectural design office and the real estate advisors. So the study argues that these tools are inserted into an unplanned environment.

The moves described in the case studies can be considered as niche activities compared to the overarching regime in the building design and construction sector. In all these case studies one of the major constraining regimes in projects is the unavailability of certified materials. The review especially reveals the problems in finding certified materials. Even though most of these materials comply with the requirement of certifications, but they do not have the certification.

Architect B states that there are niche markets in the field, which causes monopolies. For example it is seen that the credit gaining system also reflects in this issue. Architect B states that:

> We couldn't find certified materials for a number of items. However we were lucky that the building is located in an area very close to the material producer companies. This means we gained the credits lost from the material certification criteria from these criteria.[101]

This demand for certified material is seen to raise awareness in material producers. Compared to four years ago, the market has realized that this would also be a way for companies to distinguish themselves. This is evidenced in the interviews with architects and the field review by the author. The study will enlarge this discussion in the following chapter in order to indicate the premise of BEATs in enabling regime transition.[102]

Furthermore, there are niche markets fed by these tools as well, such as the renewable energy market (companies producing photovoltaic panels, wind tribunes, companies that sell renewable energy from the grid), green roof technologies, rain water collectors, efficient HVAC systems. We observe the proliferation of certified projects. These buildings might then foster the development of these markets. What these determinations indicate is that the innovation is disseminated with an unbounded effect. It has not remained in a closed building scale. However as will be detailed in the next chapter, design practices of these case studies are not radical innovations.

In terms of criteria, the study observes that design practices were limited to the criteria included in BEATs. It is not possible to reveal any new considerations beyond the assessment process. For example, architect C even states that, "Everything is thought of in these tools. Even though I may suggest something different, I can see that it is already part of the tool."[103]

6.8.5 THE OWNER PROFILE

Building owners are key persons for attaining labels from these tools, and for attaining a truly sustainable built environment, because they represent the

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[101] Architect B, *Interviews Held with Architect of Friterm Factory*
[102] This is also accounted by the architects working on project, when they recall their past experiences and compared the current situation.
[103] Architect C, *Interviews Held with Architects of Tarsu Shopping Mall*

economic side of projects. Especially for case studies, A, B, and C, it is observed that owners would benefit from their investment, not only in terms of economic return of investments but also in reputation. While case study A is a building of a firm working in the field of renewable energy, case study B belongs to a firm producing HVAC systems. For the owner of case study B, it is maintained that

> The owner believed that this building would not only represent an exemplary project for Turkey, but also would bring profit for the firm. %90 of products of this firm 90% is exported. For example we had to trace the footprints of materials. They know that in the future the firm would follow the same steps for their products. If they produce their products in such a certified building, this would bring them an extra easiness in the export. They are aware of this fact.[104]

The owner of case study C indicates that developing sustainable buildings is part of their Corporate Social Responsibility (CSR) Policy and the company aims to distinguish themselves in the market. Furthermore, all the architects underline that owners were able to cooperate with the designers and they were sensitive in these issues.

Undertaking these niche activities requires owners to take risk because their practices do not correlate with the overarching regimes. Especially finding niche market materials is difficult and some of these materials are expensive compared to other alternatives. In order to take these risks, owners have to escape from regulative and normative rules in the regimes. Actually breaking away from these rules is seen to be related with economic revenues to these companies. Thus BEATs is seen to have become an element for new marketing practices.[105]

6.9 SUMMARY

This chapter presented the analysis of the case study projects. It discussed the interaction of BEATs with existing practices, and the interaction of these practices with overarching regime rules. Chapter 3 on environmental assessment tools discussed in detail what might be the repercussions of using BEATs as design guidelines in the architectural design processes, and therefore what might be the outcome of practices with BEATs. It is suggested that BEATs might formulate one type of practice-as-entity, therefore one type of technological fix. As an entity, the criteria listed in BEATs along with the assessment categories actually disseminate certain elements to be integrated into existing practices. These elements, in the form of criteria, defined separately from each other, were argued to hamper a holistic approach to designing. However, the review of case studies indicated that at least in the technical design, because it is seen that, except for case study D and F, BEATs fostered an integrated approach in attaining energy efficiency. This discussion will be continued in chapter 7. Furthermore, owing to BEATs new

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[104] Architect B, *Interviews Held with Architect of Friterm Factory*
[105] From the survey undertaken by this study as well, it is observed that people are afraid that these tools are used solely for marketing of projects. The study cannot claim the sources from which it obtained data, but there are a number of certified projects, which obtained their label after finishing almost all the construction process. By completing LEED online documents, it is claimed that these projects received their labels.

considerations in the other regimes, like transportation regime in case B, are developed.

In fact, this chapter introduced a number of similarities in design practices, such as material selections, waste management, and water use reduction. However for architects what a practice with BEATs means exhibits differences among practitioners, and the rules followed in these practices differ from each other. In this sense, the following chapter will discuss first the meaning of practice with BEATs for these architects, and based on this discussion, it will determine the level of innovations, as a key for regime transitions in these practices, along with the role of BEATs in these innovative design moves. Following this discussion, the study will detail what might be the role of BEATs in fostering sustainability transition pathway in Turkey and will determine the main problems in using these international tools with respect to the current regimes in Turkey.

CHAPTER 7

DISCUSSION

Chapter 6 discussed in detail the implications of the knowledge, meanings, materials and images carried by BEATs on the design practices of architects. Furthermore it underscored the interactions of these emergent practices with the socio-technical regimes active on the formation of built environment in Turkey. This chapter makes a synthesis of these emergent practices based on their similarities in the application to BEATs. In innovation studies radical niche activities are considered as the key for sustainability transition. To this end this synthesis enables the study to discuss the deviances of the cognitive, regulative, and normative rules followed by these practices from those established in current regimes. By the same token, the study extends the discussion to reveal the level of innovations of these practices with respect to their nature of alignment with the key prospects of the regenerative paradigm framed by the ecological worldview. The analysis yields that a number of practices do not fall within this new paradigm. The chapter first discusses the reasons of this problem and second suggests ways to raise awareness in designing in line with this paradigm. With respect to the importance of these niche activities in challenging the regimes active on the formation of the socio-technical system of built environment in Turkey, the chapter discusses the pros and cons of the application of these tools and the market transformation through the model developed based on MLP and SPT.

This study argued that sustainability transition can only be attained by changing the worldview that guides our conception of the reality of the world phenomena, our way of knowing and doing things, and thus our paradigm. In line with the researches in the field, this study called for changing the paradigm from the one framed by a mechanistic worldview to one framed by an ecological worldview. The study argued that changing paradigm in designing lies in changing the routines of architectural practices, along with its interdependent regimes, such as transportation, technology, material production, energy, etc. By considering the significance attributed to BEATs in Turkey to attain sustainable built environment – even though it is considered to have been given an undue significance as these tools belong to a mechanistic paradigm– the study intends to understand how the introduction of BEATs into the field of built environment in Turkey triggers sustainability transition at two levels, namely, architectural design practice and then the socio-technical system of built environment. These objectives lead the study to focus on practices with BEATs in Turkey. To this end, while Chapter 5 examined the influence of BEATs in designing and in shaping the sustainability discourse in Turkey through the results of survey questionnaire, Chapter 6 discussed the implications of the knowledge, meanings, materials and images carried by BEATs on the design practices of architects in six case study projects in Turkey. It also underscored the interactions of these emergent practices with the socio-technical regimes active on the formation of built environment in Turkey.

Based on the discussion of Chapter 6, the first part of this chapter makes a synthesis of these emergent practices of case study projects with respect to their similarities in the application of BEATs. Chapter 4 indicated that innovation studies, especially MLP studies, consider radical niche activities as the key for sustainability transition. This synthesis reveals the deviances of the cognitive, regulative, and normative rules followed –probably we might speak of emergent rules as well– by these emergent practices from those established in current regimes. By the same token, the study extends the discussion to determine the level of innovations of these practices, with respect to their nature of alignment with the key prospects of the regenerative paradigm framed by the ecological worldview. Such an analysis is crucial for understanding what might be the barriers to change both the way we perceive the world, thus the lens, and the architectural routines. These barriers are apparently related to routines or practices-as-entities that have deep structuring effects on these practices-as-performances. Then it is at this point that the study was expecting BEATs to have an incentive role in changing routines. However, even without a full synthesis, from the preceding chapter and from the results of the survey, it is seen that BEATs do not perform this role. Therefore, in the second part of this chapter, the study will examine these barriers in the practices, which are considered to be in line with the old paradigm, and suggest ways to develop new practices in line with the regenerative paradigm.

Indeed these barriers in architectural practices might not be limited to the routines in designing; they might as well pertain to the other related socio-technical regimes, because these regimes, in other words systems of provision, supply the elements of these practices, such as materials, technologies, transportation alternatives, and policies. Thus with respect to the importance of niche activities in challenging the regimes active on the formation of the socio-technical system of built environment in Turkey, through the model developed based on MLP and SPT, the third part of this chapter will discuss the pros and cons of the application of these tools and their appeal in fostering market transformation.

Finally, by acknowledging the problems pertaining to BEATs, which are discussed in Chapter 3, this chapter will tie the findings of this research to the literature on tools for the advancement of these tools.

7.1 PRACTICES WITH BEATS

With respect to the discussion on case studies in Chapter 6, the study first focuses on the role of BEATs in the case study practices. Based on what meant BEATs for architects, the study determines that these emergent practices can be divided into three categories:

1. **Architects with prior knowledge on sustainable design principles** and integrated design process (IDP) used BEATs as a means of assessment, with minor adjustments.
2. For **architects with a restricted understanding of sustainability**, BEATs gave confidence in existing design principles and introduced new ones owing to IDP.
3. For **architects considering their routine practices to be in line with sustainable design principles**, BEATs only meant a technical process to be performed.

Even though this study is totally against towards such categorizations, as they might obstruct foreseeing relationships among these categories, they help maintain the focus on the similarities of these practices and equip the study with the capacity to draw conclusions about the emergent practices. In the following sections, the study will detail these groups of practices. Prior to this, the study has to recall its approach to the demarcation of levels of innovations in practices, because these categories indicate the nature of the alignment of these practices with the regenerative paradigm as well.

The study referred to three levels of innovation: Incremental, really new and radical. Incremental innovations are found in practices, which makes improvements in process or in products, while remaining in the same paradigm and thus actually pertaining to the rules of the dominant regime. Really new innovation is defined as the application of a certain technology or a process in a new field. In order to call an innovation radical, the study first stated that the innovation would be the result of a new paradigm, or a new worldview. Then it detailed that niche innovations are those which deviate from overarching regime rules: Normative, regulative, and cognitive. The study argued that changes in cognitive rules might alter the way we perceive and see the world and would therefore alter the other two categories of rules. Herein the study underlines that for this study there are two types of radical innovations, a practice might be radical with respect to the dominant regime in Turkey, however it might not be radical with respect to its nature of alignment to the regenerative paradigm.

7.1.1 BEATS AS ASSESSMENT TOOLS / RADICAL INNOVATIONS

According to the analysis in Chapter 6, the study observes that the existing practices of the architects of the case study D AKPLAZA and the case study F TMB Headquarters include the key elements of a sustainable design practice framed by an ecological worldview. In terms of knowledge and meaning, both architects are considered as practitioners of sustainable designing, as they already have a deep sensitivity to respond to the peculiarities of place. They consider the flexibility in usage, and they consider the impact of the building on distant scales. Moreover their routine practice calls for the integration of the other stakeholders, and especially the engineers. In fact with respect to BEATs, they already have the knowledge, skills, and meanings, and they already know the characteristics of materials. In this sense, BEATs cannot be the sole conveyor of these elements. This situation is considered as beneficial for the generation ever new alternatives in new design instances. From the approach of the architects to the concept of sustainability, it is seen that their accent put onto the importance of integrated design process reveals actually how the component knowledge ingrained in BEATs is translated into concept knowledge.

In case study D, the architects touch upon the decision about the function of the building regarding the requirements of the context. This represents a holistic approach to the whole design process. The choice of the function of the building represents a reflection on the requirements of the local context and therefore the scale dimension. This choice is related to the flexibility in design as well. The design of façade solves more problems with one design artifact: The privacy requirements, the sun path, the insulation, and a place for cleaning. For case study F, the design of meshwork is not only a device for shading, it has another meaning as well, that of privacy. It is not designed in an ad hoc manner for the building in order to reduce energy.

In terms of the rules followed by these architects, the study observes that case studies D and F deviate from regulatory and normative rules of the overarching regimes. In fact the most important factor that distinguishes them from the other practices is their deviance in cognitive rules, as the lens to see, know, and design projects represents a holistic approach to designing. Owing to these features the study considers these practices as ***radical innovations*** *with respect to the regime level and regenerative paradigm.*

7.1.2 BEATS AS THE APPROVAL OF EXISTING PRACTICE / REALLY-NEW INNOVATIONS AT BUILDING SCALE

According to the analysis in Chapter 6, the study observes that for the practices of the architects of the case study A (Office building in Aydın) and the case study B (Friterm Factory) BEATs had the role of approval of existing practices, while introducing new ones owing to the integrated design process followed during the technical design phase.

The study observes that both architects had a shallow or metaphorical approach to the protection of nature in the initial phase of their design processes. While architect A designs the heating center in the lobby on the ground floor so as to praise the use of clean and renewable energy with a visual experience, architect B adds plants, water elements and uses natural materials for wall and floor finishing, as an apology to nature and also accounts that protecting nature was a dream for her. In contrast to these design decisions, both architects do have knowledge and design skills on how to reduce energy of buildings. Their design decisions concerned with the zoning of functions, placements of openings on façades. Also for architect A, the choice of materials is seen to be in line with the requirements of BEATs. While reflecting on this issue, architect A recalls her undergraduate education in raising this knowledge to consciousness and her existing routine practice. For example, the background knowledge of architect B, developed over the years of her master level education, and also her concern about the possible cooling energy demand of the factory zone led her to make research on ventilation. Then for both architects BEATs acted as a reminder of their background knowledge and the basic principles of architectural design, which have been recruited to their routine.

One essential role of BEATs in these practices is the establishment of integrated design process in the technical design phase that includes architects, assessors, engineers, and material producers etc. Especially the accent put on the chain reaction to define the nature of this process is considered as a valuable contribution of these tools because their existing, routine practice has never produced such a performance. Chapter 3 criticized these tools for not enabling such a holistic approach to designing; however especially the design decisions to reduce the energy demand of the building triggered professionals in getting beyond these criteria by including daylighting and ecology as well, thus enabling networked working, thinking, and learning. The study referred to Reckwits, who states that “the ‘breaking’ and ‘shifting’ of structures”[1] would lead to everyday crises of routines, as the agents would not be able to respond to the requirements of a new practice. In these practices such a crisis is resolved over the IDP, which acted as the translator of know-that in BEATs into know-how. Furthermore, especially for case study B, the study observes that new knowledge gained over the criteria brings forth new considerations in designing. However they were amenable to being resolved through the existing practice of the architects, new spaces, the choice of materials, and the design of the parking lot.

Architects involved in these practices with BEATs, while indicating their concerns in their current projects, list the following considerations: attention paid to lightening, using gray water, using cogeneration in HVAC systems etc. Even though they were once part of a process developed upon networked knowing, this constructive mode of learning is not foreseen for their future projects. Architect A even states that she can put the design principles in advance and gain information from engineers in case she needs to. She assumes that she can comply with the IDP without the close contact of the other parties in designing, as she believes that her knowledge gained over this new practice is adequate in asking the right questions to the professionals. Architect B indicates that she adapts partially this knowledge gained over this practice to future projects, that is, an adaptation of component by component. However each new design case means new problems to be addressed, so responding to them requires developing new networks. So, the present study argues that both architects have become only learners of this process, but not fully practitioners. Networked knowing in multi-disciplinary environment enables attaining emergent design solutions. It also generates a resilient working environment through diversity. Cognitive rules or lenses that guide the seeing of the world is not altered for these architects. This is also supported by the limitation of design considerations to those found in BEATs. That is, their practices remained inside the boundaries of the projects.

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[1] Reckwitz, *Toward a Theory of Social Practices : A Development in Culturalist Theorizing*, 255.

With respect to the rules followed by these architects, it is seen that they deviate from regulatory and normative rules in regimes. In case studies A and B, for both architects with their existing meanings, considerations about natural degradation were keys in reframing the normative expectations of their clients. They are, in Chipperfield's words, antagonists, as they are the first to be in contact with clients.

In terms of normative rules, BEATs introduced new expectations from buildings, such as acoustical comfort, thermal comfort within certain limits, reducing night time lightening, use of gray water, or disposal of recyclable waste. Followers of SPT argue for changing the elements of the unsustainable practices in daily life in order to reach sustainability. We may say that BEATs have challenged a number of key elements of daily routines. For example in Turkey night time lightings are like sine qua non for commercial buildings, owing to the criteria included in BEATs, designers had to reduce and redesign nighttime lightings.[2] However in terms of thermal comfort, the normative expectations of occupants and therefore the client are not tackled. The main reason that lies beneath this determination is the focus on the meaning propelled by BEATs. Both architects underline that they gained new knowledge about how to be careful in preventing pollution due to buildings, but they had not taken decisions that alter the daily life of occupants. Architecture is not just about taking preventions; it is about changing the designs-in-practices. In other words the architectural space is as an element of the occupants' practices. Actually BEATs do not put constraints to the demand side; therefore their practice did not challenge this aspect as well. Actually this determination pertains to all the case studies carried in this study. For case study D and F, the study did not specifically come across with such an approach.

While existing practices of architects A and B include social aspects in the form of spatial qualities of daily life, when the subject matter turns into practice with BEATs, their focus turns up to be solely on optimizing the building in terms of energy, and therefore resources. In fact, one of the main principles of architecture is to provide people with a space where they feel comfortable and actually happy, and this approach to designing is part of the existing meanings of both architects. Indeed while changing these routines another issue emerges. A building can only be sustainable if it is used and protected by people. So a building might be very efficient, but if not it does function well according to the needs of its occupants, it faces a number of reconstructions or even demolishment. Since BEATs do not include these considerations in the assessment, these meanings are propelled by or left to the architects.

Even though the use of BREEAM has triggered architects to consider broader scales in terms of transportation or housing, these considerations do not stem from a holistic approach; they are just individual moves to gain credits from the constituent criteria. Actually in case study B, owing to its interaction with other regimes, a *radical innovation*, which will be detailed later in this chapter, is seen to

[2] Architect B specifically explained that this lightening was a common decision. Architect B, *Interviews Held with Architect of Friterm Factory*

have triggered. The current focus is on the practices of architects; therefore the study considers these above practices as radical innovation with respect to current regimes, but as ***really new innovations at building scale*** with respect to their alignment with the regenerative paradigm.

7.1.3 EXISTING PRACTICE / BEATS AS AN AD-HOC TOOL

According to the analysis in Chapter 6, the study observes that for the practices of the architects of the case study C (Tarsu Shopping Center) and the case study E (35. Sokak Housing District) BEATs had the role of a technological fix in the architectural projects carried out during the technical design phase.

Architect E considers their routine practice in line with sustainable design principles, and actually as mentioned before in Chapter 6, there are several reasons that support this consideration. The judgment of the architect pertaining to the development of the neighborhood in which the housing project is found makes certain projections to solve one of the major planning problems in socio-technical regime in Turkey, that is, development of gated communities, which preclude attaining a real community in neighborhoods. Rather than designing building blocks distributed over the site and separating this site from other adjacent sites by walls, the architect develops a well designed site plan on which buildings are put on the center of the area, while leaving the green area to the whole community. This approach stems from his routine practice and awareness about possible requirements of a particular ‘place.’ Furthermore the design of what is called ‘line’ resolves the problem of supporting walls, underground motorway, and the foundation of buildings in one solution.

From this example, the study argues that the worldview, or the lens, of the architect is active on the definition of the design problem-solution as a co-evolving pair. What he sees as a problem in these types of developments is actually a know-that gained over years of experiences; however his know-how belongs to his existing practice. Even though the project is assessed with BREEAM, the tool does not have a role in the formation of this approach and it remains only as technological fix to be performed, just as the choice of heating/ventilating system. It is seen from this example that know-that of BREEAM has not affected the formation of a new or emergent practice. Again this practice is a radical innovation compared to the regime level, due its design decisions, materials, and the complete design of the housing project. However with respect to the regenerative paradigm, BEATs only brought forth an ***incremental innovation*** in the product level; however the real breadth of this practice is its holistic approach to the design problem, rather than its dissecting the design problem into its parts. Therefore the study argues that due to the technological fix the practice cannot be considered as a radical innovation, but with respect to its new lens brought into scene the existing practice is ***a really new innovation at the urban scale.***

The situation for architect C is different compared to previous practices, because there are two different practices in this case, first conceptual design by another foreign firm, and second the technical design phase. Even though this study did not carry out a research on the practice of the conceptual design, there are certain interpretations which can be derived from the product. As maintained by the architect C as well, adapting the conceptual design to the technical design in line with BEATs did not reveal major problems, as the conceptual design includes passive systems to reduce energy demand of the building. Even though the concept is designed by a foreign firm, the building represents, the study argues, a suitable approach to the requirements of the 'place.' It leaves a public space to the community by also conceiving water systems that would help to generate a suitable micro-climate in such a hot climate as that of Mersin. This decision deviates from the normative rules in Turkey, as leaving a public space in front of shopping malls is not common. Spaces are rather used as parking lots, or rather than having open spaces the building usually covers the whole lot instead of conceiving a compact form. With respect to this consideration, the study considers the conceptual design approach as ***a really new innovation at urban scale.***

If we reflect on what meant the practice with BEAT to the architect C, we observe an interesting technical approach to sustainable buildings. For architect C, designing green buildings remains only a technical problem to be solved in the technical phase. Their practice with this case study actually follows an intense IDP; however the real contribution of IDP is conceived as a technical requirement. Even though new knowledge emerges out of this practice, it remains only as ***an incremental innovation***.

There seems to be a common aspect between these two case studies, namely the **rivalry between artistic/aesthetic and sustainability concerns.** There are specific reasons for this determination. As detailed as Chapter 5, even though some may suggest the opposite, there is still a division between terms architecture and sustainable architecture in Turkey. To unearth this problem, this study refers to the results of a research conducted on this issue, especially with the label of 'sustainable.'

Using the theoretical framework of Bourdieu, the research conducted by Owen and Dovey "explores the "field" of architecture through the eyes of the architects engaged in the quest for sustainable architecture."[3] They compare the practice of architect in the pursuit of sustainability to playing two games on the same field. What distinguishes the role of architects in the production of buildings is explained to rely on the creativity in design, thus in the aesthetic game. Their survey conducted with architects working in the field of sustainable architecture reveals that:

> By far the majority of architects in this study, even those who were not specifically recognised for 'design ability', were reluctant to abandon the aesthetic values of the architecture field. Yet there was a similar reluctance to remove the qualifier 'sustainable' architecture, based on the view that assimilation leads to elimination… This desire to preserve sustainability as a distinct arena within the broader field of architecture is indicative of a perceived power imbalance between the two fields.[4]

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[3] Owen and Dovey, *Fields of Sustainable Architecture*, 9.
[4] Ibid., 17

Those designing sustainable buildings are seen to be wary of co-option of the two fields due to their fear in playing the aesthetic game. Those pertaining to the normal practice are seen to be aware of the need to play the green game. They conclude by suggesting that “the most productive territory for reconciliation lies in positioning both sustainability and architecture as social practice.”[5] Actually it is the aim of this study to address the role of building environmental assessment tools in altering social practices.

For the conceptual design of case study C, architect C states that “the architect designs according to his/her artistic skills” and further adds that “conceptual designers does not design according to BEATs.” Then green building features as conceived in BEATs are considered only as a label to be attached after taking the decisions on the overall building form. This might be due to the fact that while designing architects, without being aware of it, take certain decisions based on their existing practice that include those basic architectural principles reminded to the architects of the second group by BEATs. For case study E, the study observes that formal predilection of the architect in the white line of the building blocks can be colored by the use of building occupants with shadings. However shadings and actually the design of buildings represent deviances from each other based on the direction of building façades.

7.2 HOW TO SHAPE NEW PRACTICES IN DESIGNING

This synthesis on practices reveals that the use of BEATs lead to certain similar design moves in projects that are detailed in Chapter 6. This is also supported by the survey results that indicate a considerable influence of BEATs on the design and choice of mechanical systems rather than on major architectural design decisions. Regardless of this similarity in the product, it is seen that practice with BEATs does not lead to a single type of emergent practice. These tools are inserted into an existing routine practice of architects. Their use and the approach of architects to these tools differ from each other. For architect A this practice does not diverge from her routine practices, for architect B this practice enabled her to accomplish her dream about being respectful to nature, for architect C and E this practice is only a technological fix to conceptual design, and for architect D and F, this practice was actually their routine practice. These differences can be explained with reference to their background knowledge about designing sustainably.

BEATs remain inadequate in fostering radical innovations in practices as they cannot touch upon the frames through which design professionals see the design context at hand, nor do they challenge the existing meanings or images held by the architects. Compared to the aspired whole/living systems worldview, these tools do not equip the designers with a new lens for seeing the world that would draw their attention to the contribution of the building to its context, the time dimension, and flexibility. Thus they remain as the application of a new process within the mechanistic paradigm. Therefore they are really-new innovations if the design process includes an integrated approach. Obviously the problem is related with the

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[5] Ibid., 9

dissemination of these tools as the ultimate tool for sustainability. In fact they are designed with a mechanistic worldview of efficiency and optimization. Thus there is a focus on parts instead of seeing the whole picture, which is the tie between the building in question and the overall local place, and even further the tie between the architect and the other stakeholders, including everyone who may be beneficiaries.

These buildings are evaluated individually so their contribution to their social context and the cities is not considered in these practices with BEATs as well. Actually this contribution is foreseen in conceptual design phases without the help of BEATs. For example, the public garden in front of the shopping center is not conceived as a parking lot, probably owing to the background of the conceptual designers, who had prior knowledge about designing environmentally sensitive buildings and the early request of the client for an eco-friendly building. Resilience is also related to the adaptive capacities of buildings. Except for case study D, in none of these practices has any new functional change been considered for future, so flexibility is not part of these meanings introduced by BEATs. Actually this lack has been criticized for BEATs.

Even though there are differences in approach to designing sustainably, with respect to the background of the architects D and F, the thesis argues that it is the background of architects that foster radical innovations in practice. For the practice level, along with the problem underlined above and the rivalry between artistic/aesthetic and sustainability concerns, the study argues that these problems appear to pertain to features of architecture education in Turkey that do not enhance the integration of technology and design studio courses.

7.2.1 ARCHITECTURE EDUCATION AND SUSTAINABILITY

In the personal experience of the author,[6] starting from the primary school till the end of high school, the educational system in Turkey does not foster relational thinking in students. What is taught at one course is not seen as a resource for another course. Therefore to establish a networked knowing, relational thinking represents a challenge especially for the first year education in architecture.

Architecture education at the undergraduate level is four years in Turkey.[7] After graduation, students directly gain the title of 'architect' and have the capacity to sign projects, regardless of function, project square meter. There is no state exam or any obligatory stages. During the four years of education, similar to the education system of other countries, there is an architectural design studio course in each semester starting from the second year. Other supplementary courses include building technologies, environmental design, building materials, building structures, architectural theory, and architectural history. The major problem stems from the detachment between the supplementary courses and the core studio

[6] The author of this thesis has taught for two years the first year basic design courses at a department of architecture in Turkey.
[7] 240 ECTS (In sum)

course. We may even argue that this is a problem of worldview in education, as it cannot foster networked knowing among the course content taught in separate classes. Furthermore as argued by Altomonte "lecture courses are often fragmented and alienated (physically and temporally) to applied coursework so that students are not able to fully engage with an integrated design process."[8] On this issue, Altomonte argues that:

> Specialist knowledge is generally delivered in satellite ex-cathedra lectures, with studio serving as the forum for synthesising the ideas, concepts and skills introduced into coherent design. In the lectures, it is assumed that students will learn the general principles and fundamental bodies of knowledge, which will then, in the studio, guide and inform all aspects of the design to respond to an assigned brief.[9]

Just to give an example, the following curriculum belongs to one of the oldest and well known architecture departments in Turkey (The table includes only must courses.).[10]

Tab. 7-1: An exemplary curriculum from an architecture department

First Year (1st semester)	First Year (2nd semester)
Architectural design 1 and rendering techniques Basic design and visual arts Statics	Architectural design 2 and advanced rendering techniques Ancient and Byzantine architecture Introduction to building construction Strength of materials
Second Year (1st semester)	**Second Year (2nd semester)**
Architectural design 3 History of Turkish architecture Building materials Steel structures Building construction methods Theory of structures	Architectural design 4 History of European architecture Reinforced concrete structures Environmental control studio Building element design
Third Year (1st semester)	**Third Year (2nd semester)**
Architectural design 5 History of Turkish architecture Building materials Steel structures Building construction methods Theory of structures	Architectural design 6 Contemporary architecture Conservation of historic buildings and sites Building production systems Urbanism and planning laws
Fourth Year (1st semester)	**Fourth Year (2nd semester)**
Architectural design 7 Construction management and economics Architectural survey and restoration studio	Architectural design 8 Construction project

Apparently there are many relationships among these courses and establishing the interdependencies among them is left to the core studio course. Especially over the course of environmental design, we observe that the course is carried as the transfer of component knowledge, very much in line with the definitions given in BEATs.[11] For example, architectural history courses must address this issue as

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[8] Sergio Altomonte, "Environmental Education for Sustainable Architecture," *Review of European Studies* 1, no. 2 (2009), 16.
[9] Ibid., 16
[10] The curriculum of the Architecture Department, İstanbul Technical University, http://mimarlik.itu.edu.tr/Icerik.aspx?sid=7151 (accessed January 30, 2013)

[11] Design parameters on energy efficient passive systems; design parameters on effective lighting and natural lighting system; design parameters on human health and effective noise control; heating and ventilation systems; water supply systems of buildings, waste water systems; Fire control; Current

well, by drawing on historical examples or by demonstrating how the mechanistic worldview has become the guiding lens of architects. So developing concept knowledge is left to the studio courses; however this requires maintaining a parallelism among course curricula and interaction among academics for fostering this learning environment, and therefore, breaking out conventional disciplinary compartments in education.

With respect to these problems, the study argues that the current curricula can be considered as one of the main reasons triggering the conception of 'green design' as a technical fix. In this sense, with respect to the ecological worldview, the educational system should be redesigned to reestablish the once interdependent courses.

Another key issue regarding the deficiencies of the education system is that the students of architecture and especially mechanical engineering students with a minor in building design are taught in separate classes. In contrast, once they graduate, they have to start working together. With respect to the current design routines in Turkey in the architectural design processes, this separation is reinforced, as the conceptual design process usually does not include the mechanical engineers; thus their knowledge is not recruited to the practice in the conceptual design phase. Therefore, in order to develop a new practice framed by an ecological worldview, the present study suggest making major revisions or developing a new curriculum for architectural education that fosters integrated design process by taking into account the socio-technical system of Turkey. This ambition is seen to be the objectives of the action named EDUCATE (Environmental Design in University Curricula and Architectural Training in Europe) between the years 2009-2012.[12] This research does not include the current curricula of Turkey, then for future researches this indicates a research gap in the field, because in each country there are many differences among the socio-technical regimes controlling the attainment of built environment and we can also speak of an education regime for Turkey.

7.2.2 LOCK-IN MECHANISM IN ROUTINE PRACTICES

Except for the emergent practice of case study E, the study observes that all these new practices deviate from the conventional design process, which is detailed in Chapter 5, owing to their integrated design process. Except for architects D and F, however, close contact with other design professionals is not foreseen for their future projects. There are certain lock-in mechanisms that obstruct continuing to work in such a multi-disciplinary or trans-disciplinary environment. One of the major

regulations in Turkey. A detailed discussion about the content and teaching system of these courses is not within the scope of this thesis. However in the Conclusion, there will be suggestions about course methodologies and pedagogies. A recent research in Turkey suggests revising the content and the percentage of these 'environmental design courses.' Bilge Kobaş and Özlem Bahadır, "Mimarlık Müfredatında Sürdürülebilirlik," *Ekoyapı, Ekolojik Yapılar Ve Yerleşimler Dergisi*, no. 5 (2011), 44-51.

[12] EDUCATE (Environmental Design in University Curricula and Architectural Training in Europe) is an Action funded by the European Commission - Energy Agency for Competitiveness and Innovation (EACI) under the "Intelligent Energy Europe" 2008 Programme. http://www.educate-sustainability.eu/about (accessed January 30, 2013).

problems underlined by architects pertains to the time and the budget allocated for project design detailed in Chapter 5. Changing this routine requires looking beyond the practice level and looking into the policy regime that establishes minimum project costs. Changing the socio-cultural regime in Turkey about the approach of the private sector to the amount paid to the design professionals would be a topic for future research. Therefore without altering the structures, and thus the practices in regimes, such a holistic approach to be undertaken by these professionals seems to be a remote possibility.

7.3 BEATS IN THE SOCIO-TECHNICAL SYSTEM OF BUILT ENVIRONMENT

The present study argues that with respect to the current socio-technical regime in Turkey, all these practices are radical innovations in niches, regardless of all the criticism raised about either the tools or the processes. Nevertheless, this does not mean that they can and do trigger regime transitions in this context. As argued before, attaining sustainability in the built environment requires innovations at a systemic level. This requirement is due to the fact that cities and buildings are products of networks, a socio-technical system formed out of systems of provisions. In line with an ecological worldview, therefore, making buildings individually sustainable does not guarantee attaining a sustainable built environment. From another perspective, based on MLP the study argued that as niche activities practices with BEATs should destabilize the rules sustaining the regimes in the socio-technical system. In this section, the study first examines the influence of these tools on the socio-technical system of built environment over the interactions between these niche practices and the regimes observed in case studies. Second, it discusses the inadequacy of BEATs in both responding to the regimes in Turkey and in touching upon the rules of the game.

7.3.1 NICHE-REGIME INTERACTIONS IN CASE STUDIES

At the socio-technical level, in a number of cases, practices had positive influences on the planning of public transportation, raised awareness about the need of new functional requirements in sites, and triggered developments in material regime.

For case study B, the study detailed the niche-regime interactions triggered by BEATs. Even though underneath this interaction there lies the intention to gain credits, for example, from the criteria on transportation, it is seen that BREEAM criteria had a systemic effect on the OIZ. Actually such an interaction cannot be claimed for different practices, if we consider the following instances from other certified projects in Turkey. For example, to gain credits from the public transportation, in Toyota Onatça Building[13] the building owner asks the municipality to change the location of the bus stop and thanks to the authorization he builds a

[13] A building of automobile gallery in Adana is the first BREEAM post certified building (BREEAM Europe International: Toyota Retail Units) in Turkey in 2011. The building rated very good. http://www.altensis.com/wp-content/uploads/2011/08/Toyota_Onatca_Sunum.pdf (accessed January 30, 2013).

modern bus stop just in front of his gallery. This is a typical example of part/whole detachment. Did the municipality make any research about the location of the bus stop? In Siemens building,[14] the factory provides services for workers, as there is no public transport in this area and it gains credits. LEED did not trigger a demand for a public transport system even though it is located in a highly populated organized industrial zone. So the study cannot claim that BREEAM on its own can trigger such a systemic effect on its context. In case study B, the foresight of the building owner plays a key role in developing such a network among people. However in the examples given above the decision does not take a holistic approach to planning. Then gaining credits from these criteria depends upon the interaction of these practices with, for example, the municipality regime.

The study observes that the socio-cultural regime obstructed the uptake of the criteria on reused material in case study A. This example reflects actually a crucial problem pertaining to the inadequacy of BEATs in challenging the mindset of occupants or owners. Even though the owner looks forward to have a building green certified, the existing image of what an office building would look like is not changed. If we look at the niche-socio-cultural regime interaction, the study revealed, for example, the shift in meaning of the nighttime lightening of commercial buildings as a beneficial example.

Another interaction is found between the material regime and these practices. Over the years since the first time these tools appeared in the market the study observed that the number of certified materials has grown as well. Furthermore, this niche activity has started to draw people’s attention to new technologies, such as gray water, photovoltaics, cogeneration, and heat-pumps. The study argues that the proliferation of these certified buildings will trigger market growth in these technologies. Actually herein we must indicate that this interaction cannot on its own trigger regime transition. This requires new policies in terms of selling the surplus energy to the grid. For breeding these niche activities under the mainstream technology regime, we may also look into the development in the landscape level. Currently Turkish Green Building Council is influential in drawing the policy makers towards the requirement of green buildings.

7.3.2 NICHE-REGIME INTERACTIONS: RULES OF THE GAME

In a country where planning decisions are not taken in advance, these tools show good pathways for design and daily life practices. However some of these pathways are not supported by the regime owing to two reasons: (1) BEATs, used in countries other than their origin, cannot meet the exigencies of the local context; (2) BEATs focus on parts of the system, rather than the whole.

For the Turkish context, if we consider the niche-regime interaction again in transportation, bicycle driving is not an easy and common way of transportation especially in cities. So areas allocated for bicycles would probably remain meaningless, and making these areas consumes energy for its implementation, in

[14] Siemens GOSB Building, the first building in Turkey to receive ‘Gold’ rating in 2009.

terms of embodied energy. This assessment also appears in the interviews held with green building assessors in Turkey.[15] A similar situation exists for the credits for low emission cars (LEV). The dissemination of low emission cars in Turkey is very low owing to economic reasons as well as cultural beliefs regarding reliability. Currently there is an ongoing process to reduce the taxes of these cars in order to stimulate market demand.[16] The interpretative ground prepared by the model developed based on MLP enables this study to foresee that rather than parking lots in front of buildings tax subsidies would trigger demand in these cars. There is an epistemological error than in including these criteria into these tools. Therefore in order to recruit these materials, bicycle and LEV, into daily life practices, the socio-technical regime of transportation and policy requires major transitions.

One crucial problem in these case studies pertains to the credits related with the location of the site. LEED and BREEAM supports constructing buildings in contaminated and dense zones. For none of these projects was the site selected based on environmental contamination or closeness to public transport; therefore gaining credits from the site choice remains only a coincidence. Moreover BEATs does not award negative credits for ‘wrong’ decisions; they always allocate credits for positive decisions.

Another crucial niche-regime interaction in the context is related with the waste management system. Even though BEATs allocate credits for putting recycle bins in buildings, they do not consider whether there exists a properly working waste collection system provided by municipalities. A very personal example would probably fit in this case. The author of this study does her best to separate her waste, but there is no recycle bin close to her house. Every two days she has to put the waste into her car and find the nearest bin. If the regime does not enable these sustainable practices, then allocating credits only for bins becomes very problematic.

7.3.3 ‘GREEN BUILDINGS’

The proliferation of the certified buildings, informative activities organized by the Turkish Green Building Council, and courses for LEED and BREEAM training circulating around the regime level are considered to be effective means to generate public recognition about the benefits of sustainable buildings. This recognition, along with the landscape pressures on environmental problems, is considered as the key for generating public pressure on current unsustainable socio-technical regimes. With respect to the transition pathways detailed in Chapter 4, these developments also draw the attention of regime actors, who are in the pursuit of market advantage in the field. Nevertheless there are at least three drawbacks of attaining sustainability out of the practices with these tools.

[15] Cemil Yaman cited in Selen Cevahir, "Sustainable Building Assessment Systems and Applications in Turkey" (M.Sc., Mimar Sinan Fine Arts University), 94.
[16] "Çevreci Araç Daha Az Vergi Ödeyecek," *Milliyet*, sec. Ekonomi, March 21, 2012.

As has been emphasized before, there are significant similarities between the solutions provided by certified buildings especially for reducing water consumption and energy demand. The study revealed that due to the lack of interconnectedness among assessment criteria, buildings can receive higher ratings if they concentrate on point chasing. In this context, to better illustrate the point the study shares a design solution of the first LEED Platinum building, Eser Green Building, in Turkey.[17]

To reduce fossil fuel consumption and CO_2 emissions and life cycle cost of the systems, the design team makes improvements in the façades of the building and develops a hybrid tri-generation system –composed of heat recovery systems, renewable energy technologies, combined heat and power (CHP) systems and efficient HVAC– that increased the initial investment cost by 15%. Actually the overall mechanical system is considered as an innovation. The major problem stems from the inclusion of renewable energy production systems: Wind tribune of 1kw placed on the top of the roof, PV panels of 6, 126kw placed on southern façade. Even the owner of the building underlines that this renewable energy production system is not feasible with respect to its energy production; nevertheless they added it to gain credits.

Fig. 7-1: ESER Holding, Wind tribune on the top of the roof (Left)[18]
Fig. 7-2: ESER Holding, PV panels on the southern façade (Right)[19]

Furthermore another crucial problem exists in this project and it is explained neatly by the following remarks of the owner of the building:

> The architect of our building was a pioneer in establishing the MATPUM building in METU,[20] we had a chance to have a tour of that building, before we designed our own building. Of course it was a very simple building, there was natural ventilation, there was no air-conditioning system in that building and it was much smaller than the one that we envisaged. We are a group that needs flexibility in our work. Since we work on project-bases from time to time,

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[17] The present author contacted the architect of this building. The architect informed the author that they were writing the story of the design process of this Eser Green Building; therefore the information shared in this study are taken from publications and web-casting.

[18] Semih Öncül, "LEED Platin Sertifikalı Türkiye'Nin Ilk Binası" (İzmir, Turkey, 2. Elektrik Tesisat Ulusal Kongresi, November, 24-27, 2011).

[19] Ibid.

[20] This building is located in METU campus and it is designed following environmental design considerations. The architect of Eser Holding was part of the design team of this building.

> we have to modify our rooms, we have to lift the partitions and we have to combine units, separate units, bringing more staff. And that is why it is important for us to have control over the heating, ventilation, the air-conditioning and the cooling systems. **We didn't want to leave everything to nature. We were a little bit conservative in that regard.** That is why we undertook this design [emphasis added].[21]

Then attaining comfort as an 'image' recruited to the daily practices of occupants, or the owner, and the essential the approach towards nature did not change with the recruitment of BEATs as elements to the design practices. This requirement must be fulfilled by efficient systems. So similar to the case studies C and E, BEATs becomes only a way of technologically fixing the design product without reconsidering our practices.

The study argues that this approach is supported by the current publications on certified buildings in Turkey appearing in widely read architectural design magazines with special issues.[22] From the literature review of this study, it is seen that there are two types of discourse used to explain these buildings: The explanation of the architectural features of the building is followed by the green features in line with BEATs. Usually the buildings are explained based on an 'architectural jargon' that details the design decisions pertaining to the building: How people approach the building, why for example the ceiling is made out of a certain material, why the building façade is designed opaque… Then suddenly the article jumps into another world starting with the following phrase: 'With respect to the LEED or BREEAM criteria the following design decisions are taken.' These solutions are explained as if they respond to the checklist of BEATs. The process leading to the design product and the peculiarities of the context is left out of the discourse.

This kind of approach to the dissemination of certified buildings might lead to the formation of an image of 'green building' in the public discourse, as well as for the architects, who cannot read through the relationship between the design decisions and the green features. Actually, as indicated in Chapter 4, discourse is a practice as well.[23] We might speak on the elements recruited routinely in discourses; therefore we might presume that these publications on technological fixes become elements of the discourse on green buildings. In other words, the sustainability definition of these tools with all its problems, which are discussed in Chapter 3, are immersed into this discourse. The diffusion of these images and its allied meanings in daily practices would probably result as a new structure for the conceptions about sustainability for the public.

In Chapter 5, the study shared the definition of sustainable buildings given by professionals who worked on projects with BEATs. The study underlined that actually a number of these definitions are very much in line with the constituent

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[21] Can Adiloğlu, "Eser Green Building Concept and Implementation of Design " (Ankara, Conference: Buildings of Today and Tomorrow's Reality, May, 10-11, 2011).

[22] *XXI, Yirmibir Mimarlık, Tasarım, Mekan Dergisi, Yeşil Binalar Referans Rehberi 2012*, ed. Tuğba Demirci (İstanbul: Depo Yayıncılık, 2012).

[23] Reckwitz, *Toward a Theory of Social Practices: A Development in Culturalist Theorizing*, 243-263.

criteria defined in these tools. Furthermore a considerable number of responses given by professionals who didn't participate in such a process, combine two approaches in the same definition: Buildings that reduce their impact on environment by providing a health working environment. The study cannot certainly claim that these definitions are shaped after these tools, as the comments of the respondents reveal that design professionals are skeptical about the use of these tools for marketing of projects. Nevertheless their approach to sustainability does not diverge from what is listed in these tools.

7.4 TRANSITION PATHWAY WITH BEATS?

Based on a systems thinking, MLP studies, by taking a long term perspective, overlay the historical evolution of the regime transitions, such as in transportation, agriculture, and communication. It is seen that the innovation studies have started to conceive sustainability problems from this perspective, which widens participation by taking a multi-actor approach. Even though the time span –only five to six years– examined by this study is not enough to determine the evolution of the regimes in socio-technical system of built environment with BEATs at the niche level, this study aims at making a projection about the transition pathway guided by these tools. This projection might enable future researches in assessment tools, as it indicates how these tools do not impact only on the design and construction process of buildings.

Through the survey results, the study indicated that one of the major reasons for a building owner to have his building certified is seen to depend on his desire to be in the market front. So building owners, while operating at the niche level, aim to gain market recognition and elevating the price of their buildings. In this sense, the study argues that BEATs are followed based on the landscape pressures of marketing, rather than the urgency of environmental degradation. Actually this reason underlying the uptake of these tools is seen to be criticized by the respondents, who underlined that these tools might lead to only 'green-wash.'

As BEATs do not foster radical breaks in regime practices, certifying buildings conceived as technological fixes can be attained only by adding new technologies to the heating and cooling systems or just choosing more sophisticated rain water collections equipments. Currently in Turkey these systems can be found in the niche markets, along with photovoltaics, which are promoted by these tools. Furthermore, many construction materials, such as bricks or steel frames found in the material regime, comply with the material specifications of BEATs, but do not have the relevant certification to demonstrate their compliance with criteria. Then companies for gaining market advantage is seen to have started for making required certifications, even detailing from which assessment criteria the use of a particular material might award credit to the project.[24] Another key contribution of these tools in Turkey is seen to be in the science regime. We observe that a

[24] http://www.izoduo.com/surdurulebilirlik-cevre/izoduo-ve-leed-yesil-bina-sertifikasyonu, http://www.artema.com.tr/cms/catalog/108/Leed-Brosur.pdf, http://www.kale.com.tr/UserFiles/Image/products/ groups/ks/pdf/KX_ECO.pdf

growing number of graduate thesis and dissertations are studying the impacts of these tools in the Turkish and dealing with the exigencies of a Turkish Building Environmental Assessment Tool.[25] Moreover probably the first impact on the policy regime has just been introduced at the end of 2012. The Ministry of Health has just put into force a new legislation: Hospitals with more than 200 beds should be certified with LEED.[26]

Based on the synthesis on case study projects and the survey results, the present study argues that in Turkey BEATs appear to guide the transition in regimes towards a ***'reconfiguration pathway'*** defined in MLP based on the landscape pressures of marketing. Current regimes uptake certain developments from niches to alter their configuration and therefore the future socio-technical system of built environment would result from the old regime. However this new configuration, the study argues, would not result in a definitive solution to the current environmental problems. In the first chapter, the study referred to the conceptual map of world phenomena prepared by Capra. Actually making the regime transition requires a systemic approach that considers the relationships among policy, technology, socio-cultural regimes. Therefore BEATs remain inadequate to make the sustainability transition in regimes as required by the regenerative paradigm. This is because configuration based on these tools would not foster a holistic approach to the regimes forming the socio-technical system and would not enhance an integration among the policy, transportation, housing, material regimes.

7.5 BEATS AS ELEMENTS OF PRACTICE?

This study underlined that in a number of case study projects fulfilling the criteria on energy consumption, daylighting and comfort were considered as a whole while taking decisions, through an integrated design process. However this integrated process is not foreseen for future projects by the architects, who already hold that their existing practice is sufficient for responding to the demand for holistic approach. Furthermore, for architects who are strongly tied to their existing practice these tools do not challenge them to re-conceptualize their existing knowledge and meanings. Therefore the major barrier in attaining sustainability in built environment at the practice level lies in the performances-as-entities stabilized over the years. The study argued that the existing practices are the key for making radical innovations in practices for enabling a paradigm shift in architectural practices towards the regenerative paradigm. To this end, to reshape those existing practices, a first step would be a new educational system that fosters integrated design process in designing by including students from the disciplines related with the shaping of the buildings and that reconsiders the interdependencies between the courses taught at architecture departments.

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[25] Yılmaz, *Türkiye Için Yeşil Bina Performans Kriterlerinin Belirlenmesi Ve Yeşil Bina Performansına Yönelik Bütünleşik Tasarım Yönetim Modeli Oluşturulması*; Cevahir, *Sustainable Building Assessment Systems and Applications in Turkey*; Meltem Türker, "Green Building Rating Systems: An Assessment for Turkey and the Case of Erzurum Shopping Center - the First BREEAM Certified Building in Turkey" (M.Sc., İstanbul Technical University), .; Gamze Topçu, "Türkiye'De Sertifikalı Yeşil Bina Uygulamasının Örnek Bir Bina Üzerinden Irdelenmesi" (M.Sc., İstanbul Technical University), .

[26] *Mevcut Ve Yeni Yapılacak Sağlık Tesislerinde Uyulması Gereken Asgari Teknik Standartlar,* (2012): 13.

Due to its mechanistic approach to assessment, fulfilling the criteria in BEATs does not enforce design professionals in breaking the rules of the regimes, for example the normative rules regarding the recycled materials in façade, the required comfort level in buildings, and so on. As has been maintained before, BEATs do not allocate negative credits. Furthermore, as stated by architect E, these tools cannot assess the contribution of the architectural features of buildings as in the following examples: The public space in front of the shopping center or in front of the TMB Headquarters, the green area left for people in the housing project.

If BEATs are to remain as the de facto design guide for attaining sustainability in built environment, the study argues that they should be redesigned to destabilize or break the recruitment of elements of existing practices. First, for the Turkish context, based on the analysis of case studies and the current dominant regimes that work without a coherent approach to spatial planning and especially transportation, the study suggests that BEATs should award credits for the following issues in the Turkish context: Choice of building function, optimum transportation plan that considers the neighborhood scale, and the contributions of the architectural design features with respect to local users' daily life practices.

Second, in general next generation tools should foster design professionals and the future occupants to re-conceptualize new lifestyles aligned to the cycles of nature, which would thereby lead them to relinquish existing meanings about comfort. Third these tools should draw design professionals into the interactions between currently existing assessment criteria. As these niche practices remain at the building scale, if the routine or existing practice of the architect does not include the principles defined for the ecological worldview, BEATs should redefine criteria that foster the conception of a building as part of an interdependent whole – therefore a part of cities– and focus on the contribution of the building to the resilience and the diversity to communities.

CHAPTER 8

CONCLUSION

We have created **a new world**
a consumerist lifestyle
new technologies
a new economy
a 'built' environment
that this **World** cannot sustain anymore.

To sustain the World we have created a concept, sustainability and we have diffused it to almost every discipline. So it can arguably be called the 'catch-word' of our era. For our field, we have created new standards, benchmarks, assessment and design tools to attain this elusive and controversial the state of being sustainable.

What has happened over a span of a century so that this 'built' environment has become one of the main causes that have degraded the environment? The study, in line with the researches in the field, argued that we started to use a lens that gave a misrepresentation of world phenomena, that induced people to reductive thinking, and that in the meantime enabled us to 'efficiently' use world resources. This crisis of perception, stemming from our mechanistic/modernist worldview, is therefore explained to be the major reason of the lost of synchronization between nature's time and human time, in other words, sustainability problems.

Then to reshape this world anew, the study underlined that currently the field is dealing with ways to change the paradigm framed by a mechanistic worldview to one informed by an ecological worldview. This call for a paradigm shift indicates that we ultimately need to change how things are done. For the field of architecture, however the study explained that such an innovation cannot be limited to the architectural designs and design processes; it requires deep structural changes within the whole socio-technical system of built environment, including our lifestyles as well. As the whole system is formed out of seminal systems of provision, such as energy, technology, and policy, that structure, hold and back up the architectural practices, the study put forth that innovations demand a systemic approach.

Amongst these calls and the growing number of alternative design and assessment tools, the study drew our attention to a particular set of tools, which appear to dominate the 'real' market. The building environmental assessment tools (BEATs), such as BREEAM, the Procedure HQE, and LEED have significantly affected both the public and the market awareness and perception of what sustainable building is. Furthermore these tools, due to the lack of better alternatives, are used as design guidelines, instead of their original objective as assessment of projects. Even though the author of this study was well aware of the criticisms raised about these tools, the growing interest in these tools, especially in Turkey, pushed this thesis to answer the following major questions:

> In an era where we need innovation at a systemic level, in an era where the concept of sustainability still remains elusive and controversial, how can tools like LEED or BREEAM, which claim robustness in assessment and which are criticized for their pursuit of the old-dated mechanistic worldview, nevertheless be used widely in the building sector in Turkey; and while triggering the formation of a sustainability discourse, how do they interact with 'the rules of the game'?

Underneath these questions lie the seminal questions by Robert Thayer:

> Can a few conspicuous solar homes, constructed wetlands, bike paths, recycling industries, wildlife habitat corridors, organic agricultural plots, and wind farms really be the key to saving the world? Isn't a much greater transformation needed in global economic, political, and social institutions?[1]

Changing the worldview is considered to be the prerequisite for a greater transformation in institutions, thus a paradigm shift, that is, the most effective way to change this system. Systems or the practices that shape these systems result from established paradigms. From the perspective of practice theory, the continual recruitment of the same elements into doing things actually results in the stabilization of practices, which ultimately structures new performances. These tools, BEATs, are then inserted into an established system of practices. Even though these tools are considered to be operating at the lower range of effectiveness for changing a system,[2] if the future direction and success of sustainability in built environment, especially in Turkey, rely on the abilities of these tools, then is worthwhile to scrutinize their implications for this system.

To this end, by considering the questions outlined above, this study intended to understand what would be the promise of these tools (only the tools for assessing new constructions) in steering us towards a new paradigm, possibly through a number of radical innovations, which diverge from the cognitive, regulatory, and normative rules of the context. Addressing this question led this study to carry out case studies on projects certified with BEATs and to look at two levels in which BEATs would possibly be effective: (1) The architectural design practice level to see how the architects accommodate their practice relative to BEATs and whether these practices introduce radical innovations; (2) The socio-technical system of the built environment (that sustains the practice level) to determine the interactions between these practices and the regimes. To gain a holistic understanding about

[1] Thayer, *Gray World, Green Heart*, 189.
[2] Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 440.

the appreciation of these tools in the field, the study also conducted a survey on two groups of professionals –those who worked on certified projects and those without prior experience.

8.1 GROUNDING THE STUDY

These objectives led this study to prepare the ground that guides the study to explore the tools and the case studies. **Chapter 2** laid down both a theoretical ground for indicating the interdependence between our worldviews and our epistemologies and a historical background on the evolution of the concept of sustainability in architecture, by drawing the study to the key aspects that must be addressed while designing sustainably, that is, informed by an ecological worldview.

With respect to the main problematic of our era, that is, the crisis of a perception triggered by the mechanistic worldview, Chapter 2 first explored the role of worldviews in shaping conceptualizations about world phenomena. Following Bateson and Sterling, it argued for a close relationship, thus interdependence, between how we know things (epistemology), descriptions of the structure, function and nature of the things (worldview), what things are (ontology), and therefore how we act within this world (methodology).[3] This conception enabled the study to explain why the change in epistemology, brought first by the researches in biology, has led to an alteration in worldview, and thereafter the paradigm within which we perform our activities. Scientific developments, especially in biology starting from the beginning of the 20th century, has brought a new way of seeing and knowing these systems, thus replacing the old analytical approach to nature and complex systems with that of an ecological worldview.

The study argued that the changes in seeing the world has resulted in a new way of thinking and knowing, that is, systems thinking, which by accepting that "properties can only be understood within context of larger whole,"[4] replaced the machine metaphor (which assumed that the whole can be deduced from the sum of the properties of its parts) with that of a network metaphor.[5] The chapter thereby drew our attention to relationships, to emergence, to non-linearity, to the role of contextual forces in systems, and therefore brought forth the crucial need for a holistic approach to analysis that calls for looking into the interdependencies among the parts forming the whole. Furthermore changes in the way we know nature has underscored that nature has capacities for adaptation, being dynamic, unpredictable, process-driven, and always in a state of non-equilibrium.[6]

By drawing on the economic, social and political events from 1960s onwards that have been effective on the evolution of the concept of sustainability and the

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3 Sterling, *Whole System Thinking as a Basis for Paradigm Change in Education: Explorations in the Context of Sustainability*
4 Cole, *Environmental Issues Past, Present and Future: Changing Priorities and Responsibilities for Building Design*, 6-9.
5 Tanzer and Longoria, *Introduction: Networked Ways of Knowing*, 6.
6 Du Plessis and Cole, *Motivating Change: Shifting the Paradigm*, 439.

formation of the tripolar model, the study argued that currently there is no definite approach to attain sustainability in architecture. However, it has also argued that owing to the developments in the internalization period, what is called an eco-technic logic underpinned by a mechanistic approach has become one of the main leading conceptions of sustainability in the field. This has propelled the field to define best practices and has also fed the ground on which BEATs are built. The chapter reflected upon how the static and reductive thinking impelled by mechanistic metaphor has led to conceive buildings "as closed, localized system with circular metabolisms that self-regulate into an equilibrium state,"[7] designed following the objective of no waste and maximum resource efficiency, and thus conservation of the status quo. While enhancing optimization, balance and efficiency in designing, the study underlined this has resulted in unwanted consequences. Focusing on parts, ignoring the couplings of parts, and not conceiving the whole render these design processes reductive in problem definition and analysis. Such an approach is claimed to impede the contextualization of design problems. In a similar vein, this logic has also fostered the belief in technologies as the ultimate means to alleviate sustainability problems and the normative rules concerning especially the comfort expectations. In this respect, the study also made a critique of this firm belief in technologies, while arguing that it has shaped a society of 'technopoly'.

By asserting that a new sustainability paradigm framed by whole/living systems worldview that also internalizes an eco-centric approach to nature is a prerequisite for an ecologically adaptive way of living and designing, Chapter 2 indicated that we, as designers, are expected to re-conceptualize and reconfigure our design practices that "integrate social and ecosystem factors in a co-creative process."[8] The study revealed that a considerable amount of research accepts and promotes 'place' as the primary starting point for design. This is because framing design solutions bound to unique social, ecological and economic opportunities of places and conceptualizing the environment as systems rather than building blocks foster a holistic approach to the design process. Finally the study detailed the key aspects of designing along this worldview to prepare the ground for the comparative analysis in the case study projects. Rather than attempting to find a universal model and confining sustainability to the performances of the building as a separate entity, focus on place calls also for a shift in the role of the designers or architects from being a master mind to a facilitator of a process of revealing.[9] The architect reveals the place, thus the "situated knowledge."[10]

Chapter 3 first gave an overview of the general characteristics of BEATs in terms of their initial objectives and success, it then introduced the case study tools, that is, BREEAM and LEED, and finally it conducted a review on the state-of-the-art on the critiques of these tools. The chapter raised four major critiques on BEATs.

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[7] Ibid., 439.
[8] Ibid., 440.
[9] Du Plessis, *Towards a Regenerative Paradigm for the Built Environment*, 18.
[10] Haraway, *Situated Knowledge: The Science Question in Feminism and the Privilege of Partial Perspective*, 575-599.

First, the study criticized these tools as institutionalizing a particular, anthropocentric, and “limited definition of environmentally responsible building practices at a time when exploration and innovation should perhaps be encouraged.”[11] Second, in line with Cole, the study argued that these tools represent a mechanistic approach to assessment, as they assess the whole building out of the characteristics of its parts without foreseeing the interactions among the criteria in tools, that they confine the assessment to the individual building scale without understanding the local environment, and that they do not consider the flexibility in assessment, therefore the time dimension. Third, the study underlined possible drawbacks of using these tools as design guidelines: Fourth, the study indicated the inadequacy of the output profiles of BEATs in informing the stakeholders, especially the design team, about the implications of various design decisions on indicators or on the overall performance. Furthermore Chapter 3, in line with Kaatz *et al.*, discussed what might be the role of BEATs in the design process. With respect to the problems delineated in the chapter, the study concluded with a possible consequence of the use of BEATs in guiding the projects.

Studying cases required heuristic tools that enable a holistic approach to the field and that explain how innovations, especially radical innovations, might come into being. The study pursued two heuristic frameworks developed in the nascent field of sustainability innovation studies. **Chapter 4** first explained its approach to the level of innovations and made a distinction between bounded and unbounded innovations, and continued with the key characteristics of socio-technical systems. These systems or agents actually share these rules and this give birth to what it is called regimes. Consequently it discussed how these regime practices – be it in technology or in energy – structure, in other words constrain, future practices.

The objectives of the study required a two-level approach. To examine the interactions between the practices guided by BEATs and the socio-technical system of built environment, the study referred to a middle-range theory developed in innovation studies and called the Multi-Level Perspective (MLP). MLP sees innovation and transitions as a result of the tensions between three vertical levels: Niche, regime (practice), and landscape. Actually, recent researches indicate that niches might not be the sole conveyor of radical innovations; therefore the study detailed possible drawbacks of MLP and used it only for its heuristic ease. In line with MLP, the study explained the reasons for accepting practices with BEATs as a niche activity in view of the number of new constructed buildings against the certified buildings in Turkey. The study detailed diverse possible transition patterns defined by MLP to discuss later how BEATs possibly guide such a pattern.

To examine how innovations in practices come into being and explore the use of BREEAM and LEED within the design practices in Turkey, the study referred to *social practice theory* (SPT), which sees innovation in practices as a result of the

[11] Cole, *Building Environmental Assessment Methods: Redefining Intentions and Roles*, 463.

integration and then horizontal circulation of different elements to practices.[12] The chapter adapted the heuristic model developed by Pantzar and Shove, which foresees practices as the result of three elements (material, knowledge/skill, image/meaning), so as to study architectural routine practices in the context of the case projects.[13] The study argued that we might observe that practices with BEATs would represent deviances from normal or routine architectural practices. Furthermore, based on a discussion on how design artifacts, once completed, might have a role in shaping (un)sustainable lifestyles, the study made a distinction between design practices and designs in practices.

In order to understand niche-multi regime interactions within this field, the study referred to a heuristic tool developed by Hargreaves *et al.*[14] based on an analytical framework originally developed by Shove in the context of practices.[15] The present study elaborated this model to combine the MLP and SPT approaches so as to study the influence of BEATs on multiple regimes.

Chapter 5 laid down the 'normal' practices in architectural design processes and the current 'co-evolving' socio-technical system in Turkey. It detailed that the current architectural design processes cannot pursue an IDP due to the economic and time constraints put by the regimes. The chapter briefly explained the initiatives in the policy regime in attaining energy efficiency in buildings in Turkey. It discussed normative expectations of users or building owners and how certain construction materials have also become part of these normative rules. This overview prepared the ground for the comparison of new or emergent practices with BREEAM or LEED with the old ones.

In Chapter 5, the study shared the results of the survey questionnaire. Even though the response rate was too low to perform a statistical analysis (27 responses from professionals who took part in practices with BEATs; 106 responses from design professionals without prior experience), The 27 responses from professionals in the first group gave invaluable information on which design decision BEATs were effective, during which phase the decision to certify the building is taken, and major barriers in implementing BEATs. The results revealed that BEATs were mainly influential in the choice of mechanical systems, landscaping, and material decisions. The study observed that BEATs were mostly influential in the decisions about technological improvements, rather than main architectural decisions. The major motivation of certification is seen to be the owners' intention to gain market recognition and advantage. The survey functioned as an antagonist in Turkey to

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[12] Hargreaves, Longhurst and Seyfang, *Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory*, 1-25.

[13] Pantzar and Shove, *Understanding Innovation in Practice: A Discussion of the Production and Re-Production of Nordic Walking*, 447-461.

[14] Hargreaves, Longhurst and Seyfang, *Understanding Sustainability Innovations: Points of Intersection between the Multi-Level Perspective and Social Practice Theory*, 1-25.

[15] Shove, *Comfort, Cleanliness and Convenience: The Social Organization of Normality*, 192-193.

draw people's attention to the contribution of BEATs to sustainability in architecture.[16]

8.2 TOOLS IN PRACTICE

The study then turned again to the major questions that have driven the whole research: What do BEATs really do in practices; do they touch upon 'the rules of the game'?

8.2.1 TOOLS IN DESIGNING

In Chapter 6, the study carried six case study projects from Turkey which are certified or are in the assessment process with BREEAM or LEED. It examined the design practices of these projects to determine how the recruitment of the elements (knowledge/skills, image/meaning, and materials) brought into the process by BEATs influenced, or possibly got immersed into, the practices-as-performances. Through the model that integrates the SPT approach with that of the MLP, the study looked for possible practice-regime interactions. The study formulated an operational diagram for each project that explained the relationship between the existing practice of the architect and the emergent practice with BEATs. The model served the study in three ways: (1) Delineating the differences between the new/emergent practice (practice-as-performance) and the regime practices (practices-as-entities); (2) Indicating whether new practices are constrained by regime rules or whether they triggered regime actor for new practices and considerations; (3) Evaluating the alignment of the rules followed by the new practices with those defined by the regenerative paradigm.

Chapter 6 presented the analysis at two levels, case study level and cross-case study level, and explained the similarities observed in practices. In Chapter 7, the study carried out a full discussion about the impacts of these tools both on practices and the socio-technical regimes in Turkey. I t also discussed the reasons why a number of practices do not fall within the regenerative paradigm to devise ways to raise awareness in designing in line with an ecological worldview.

The synthesis of case studies brought forth three categories:

1. Architects with prior knowledge on sustainable design principles and integrated design process (IDP) used BEATs as a means of assessment, with minor adjustments.
2. For architects with a restricted understanding of sustainability, BEATs gave confidence in existing design principles and introduced new ones, owing to IDP.
3. For architects considering their routine practices to be in line with sustainable design principles, BEATs only meant a technical process to be performed.

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[16] Previous surveys made on this issue are seen to have focused on the importance of the criteria to be included into Turkish tool, and the motivations and the barriers to adoption.

The study argued that BEATs might yield a certain type of practice; however these differences in practices did not prove this argument. Even though the study showed certain similarities in design moves in projects, rather than on major architectural design decisions, it is seen that practice with BEATs did not lead to a single type of emergent practice. This is explained with respect to differences in the existing practices of the architects, as their existing routines had structuring effects on using and approaching to these tools. The practices in the 3rd category especially revealed that BEATs only meant a technical process to be performed, leading the technological fixing of a project to conform to the criteria requirement.

The study observed that the checklist manner of BEATs in assessment might lead to point-chasing, without considering the interdependencies among criteria. The study found that for the 1st and 2nd category practices, IDP enabled generating a holistic approach to designing. Again in one of the case studies of the 3rd category, IDP was followed for the technical design phase. However, with reference to interaction table prepared by this study (see Tab.3-5), except for the practices in the 1st category which has already internalized a holistic approach, this process meant optimizing buildings with ad hoc technologies and minor revisions to the building design, rather than bringing a complete integration of all the criteria.

Even though there are problematic issues in the 2nd and 3rd category practices, with respect to the overarching regime practices in architecture in Turkey, the study considered all these emergent practices as radical innovations, as they deviate from the normative, cognitive, and regulatory rules followed by regime actors. In fact, prior to the application of these tools the practices of these architects were more or less divergent from the regime practices in terms of their sensitive approach to nature or to the urbanscape, and therefore in terms of the meanings/knowledge/materials internalized in their practices. However the study focused on the contribution of these tools in recruiting new meanings/knowledge/materials to the existing ones.

With respect to the nature of alignment of these emergent practices to the regenerative paradigm, the study revealed that these cases form three categories:

- *Radical innovations* are found in the practices of architects in the 1st category. Meanings, which are internalized in the process (e.g. flexibility and local context), indicate that they are practitioners of the new worldview. BEATs have little impact on their design decisions.
- Architects in the 2nd category represented *really new innovations at building scale* owing to BEATs; however they are still bound to their existing practices. BEATs obstruct attaining diverse alternatives, as design considerations are confined to the criteria found in the tools.
- Some of the practices of architects in the 3rd category fall within the new worldview and represent *really new innovations at urban scale*. These practices do not stem from the use of BEATs, which do not challenge architects to consider new design approaches.

At the practice level, the study revealed two major findings: (1) it is the background of architects that foster radical innovations in practice, rather than BEATs; (2) there is rivalry between artistic/aesthetic and sustainability concerns. Therefore, the component knowledge brought by BEATs did not actually foster innovations. In other words, architects just learnt about this new practice with BEATs; however did not become practitioners of a totally new practice. The study argued that these problems appear to pertain to features of architecture education in Turkey, which do not enhance the integration of technology and design studio courses. Therefore it argued that the education is also a regime in the socio-technical system of built environment. Furthermore, the study underlined that current regime sustains practices with economic and time constraints in terms of the budget allocated to the project design. This leads to the conception of 'green design' as a technical fix if the existing practices do not consider the imperatives of the regenerative paradigm.

8.2.2 TOOLS IN THE SOCIO-TECHNICAL REGIMES

With respect to the importance of these niche activities in challenging the regimes active on the formation of the socio-technical system of built environment in Turkey, the study discussed the pros and cons of the application of these tools and the market transformation through the model developed based on MLP and SPT. At the socio-technical level, in a number of cases, practices had positive influences on the planning of public transportation, raised awareness about the need of new functional requirements in sites, and triggered developments in material regime. In some cases, the socio-cultural regime obstructed the uptake of certain criteria. In a country where planning decisions are not taken in advance, these tools show good pathways for design and daily life practices. However some of these pathways are not supported by the regime owing to two reasons: (1) BEATs, used in countries other than their origin, cannot meet the exigencies of the local context; (2) BEATs focus on parts of the system, rather than the whole.

The study argued that these niche practices remain at the building scale, do not enforce breaking the rules of the regimes, and therefore remain inadequate to make the sustainability transition in regimes as required by the regenerative paradigm. Therefore fulfilling the exigencies of BEATs might not yield a holistic approach to the local context, as this type of designing-as-practice and designs-in-practices – if not supported by regime practices – do not trigger transformations in regimes and would not lead to radical innovations that reconfigure the whole socio-technical system. In this sense, in the case of Turkey, the study suggested that BEATs appear to guide the transition in regimes towards a 'reconfiguration pathway', defined in MLP based on the landscape pressures of marketing rather than sustainability. Furthermore, with respect to the way the certified projects are presented and promoted in the field, they would certainly impact on the sustainability discourse. However this discourse currently seems to be aligned with a mechanistic approach. Nevertheless, the growing number of these buildings is seen to have been effective in fostering new scientific researches that might in the near future redefine a new perspective for the context. Finally, the study concluded that if these tools remain de facto guides for sustainability, reconsidering next generation tools in line with the new worldview as well as the features of the architecture education seems to be an urgent requirement. For the Turkish context, the study suggested that BEATs should award credits for the following issues:

Choice of building function, optimum transportation plan that considers the neighborhood scale, and the contributions of the architectural design features with respect to local users' daily life practices.

8.3 FUTURE RESEARCH OPPORTUNITIES

This section aims to present the opportunities for future research activities. The section starts by underlining the limits of this study, as these limits can become a starting point for future research.

8.3.1 LIMITATIONS OF THE CURRENT STUDY

The most important limitation of this study is that there were no participatory observations conducted within the design processes of the case study projects. The study conducted semi-structured interviews with architects. Therefore architects had to recall the process, and this might have reduced detail in the explanation of the design decisions. As the study particularly aimed to understand the appreciation of BEATS from the perspective of the architects, it did not perform interviews with the engineers who took part in the process. Furthermore this study did not focus on the implications of these tools on the construction practices. As indicated in Chapter 5, current construction practices are replete with a number of problems obstructing making innovations. Therefore participation in the project meetings and making interviews also with the other stakeholders, including those working on the construction side of these projects might draw a broader perspective on emergent practices.

A second limitation of the methodology was that the study carried out only six case study projects, and three of them are made from secondary sources. Furthermore, to delineate a possible transition pathway with BEATs, it was able to look at only six years. Therefore, even though the study draws some conclusions about the impact of these tools on practices and the regime, it cannot make generalizations. Nevertheless, the determinations of this study can be used to develop hypotheses for future research opportunities.

8.3.2 FUTURE OPPORTUNITIES

During the course of this research, several areas were revealed for future research tracks.

First, the present study adapted a model developed for studying everyday practices based on social practice theory into the context of architectural routines. To the best of knowledge of the author, there is currently one very recent research that suggests taking a SPT approach. In the same manner, this study used MLP to study the interaction between design practices with BEATs and regime practices, and there are only a few researches, mostly concerned with eco-houses or niches fed by municipalities, in the field. Therefore, future research is needed to develop the application of these theories for the study of built environment or to indicate any inadequacies and fallacies.

Second, regardless of the problems stemming from these tools, the benefits of these buildings with respect to those built by the regime practices should be made public, as they at least deviate from the regulatory rules of the regime. Therefore, rather than explaining buildings over their mechanical equipment, performing and sharing post occupancy evaluations of these buildings, accompanied with interviews held with their occupants, could be a new research track for the Turkish context. People's normative expectations from buildings do not depend on the systems used by these buildings, but they look for the electricity or natural gas bills. Sharing these results might create a public pressure on the regimes to deliver environmentally sensitive buildings.

Third, the survey conducted in the study, besides enabling the study to understand the appreciation of these tools by design, construction, and academic professionals, has also underscored the need of future researches. The results indicated that in several cases the survey results did not prove the hypothesis of this study, especially the responses given to the question on the disconnection between assessment criteria in obstructing to attain a holistic perspective to designing. People did not consider this problem as a barrier to holistic thinking. Nonetheless, the case studies did demonstrate the relevance of these singular design moves to gain credits from the constituent criteria. In this sense, the study argued that future research can draw onto this discrepancy, as people's evaluation about their own process might not mean that they are actually following an integrated design process that gains a holistic approach to designing.

Another unexpected outcome of the survey was that the last question, that is, the comments box,[17] was filled with two types of approaches to these tools: (1) People calling for the dissemination of these tools; (2) People believing in the inefficiency and unsuitability of these tools owing to their use for marketing purposes. Actually the survey results indicated that (35% strongly agree; 42% agree; 14% neither agree nor disagree; 3% disagree; %3 strongly disagree; 0,7% not sure/not applicable) design professionals foresee benefit in tools in triggering the building industry towards sustainability. The study underlined that revealing the correlation between the knowledge held by people about these tools and people's approach to these tools might be also be part of a new research, because the study argued in Chapter 4 that public pressure on current regimes might redirect regime actors to borrow the good practices in niches. As the architects are usually the first ones to get in contact with building owners, this belief in tools might trigger new expectations.

Fourth, in Chapter 2, the study discussed one of the key characteristics of complex systems. It underlined that due to nonlinear relationships, or networks among the parts, these systems exhibit emergent characteristics. Architecture and actually designing means working in a world full of probabilities and assumptions about the future. Therefore based on an ecological worldview, the current study argued that these assessment tools cannot present the contribution of these building accurately in advance, as once they become part of the system, these buildings

[17] This question was not obligatory to fill.

might trigger unforeseen relationships and lead to emergent impact on their neighborhood. However revealing these emergent behaviors can only be the study of future research.

And finally, as this study argued that architectural education might represent another regime in the socio-technical system of built environment, it called for a revision of curricula that would be in line with an ecological worldview. With respect to the role of years of education in implementing the first seed of the practices, in other words the elements effective on the formation of the routines, future research might examine curricula from the perspective of social practice theory.

8.4 CLOSING REMARKS

Regarding the urgency in changing the education system in Turkey, a few words to end this work are due here on the curriculum practice in a new architecture department in Turkey, of which the author is currently a member.[18] The department is implementing an experimental curriculum for the first time in Turkey. It consists of five principles modules: Architectural Design Studios; Architectural Theories, Histories and Cultures; Design Presentation and Research Methods and Techniques; Building Technologies and Elective subjects. These modules are structured based on a principle that utilizes the progressive and updatable characteristics of the modules as *content* and *time.*[19] Each module is established in such a way that it considers its interactions over the years in terms of content. It is the hope of the author to establish courses introducing students to the limits of Earth and to the impact of our practices on Earth, to sensitize students to an ecological worldview, as part of the building technologies modules by considering the key prospects of sustainability laid out in this study, and to develop an architectural design studio course that fosters integrated design process.

[18] The Architecture Department at TOBB University of Economics and Technology was established as of March 2011, and has started its teaching activities in September 2012.
[19] Nur Çağlar, "Editorial," *Serbest Mimar*, no. 10 (2012), 8-13.

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APPENDICES

APPENDIX

A APPENDIX 1

THE SURVEY QUESTIONNAIRE

Dear Participant,

I am conducting a doctoral thesis entitled "The Implications of the Use of Building Environmental Assessment Tools within the Building Practice in Turkey" at Politecnico di Milano in Building, Environment and Technology Department. I am working on the possible implications of environmental assessment tools, such as BREEAM or LEED, on the architectural design processes of new buildings.

Your opinions and experiences in the field would be beneficial for my study. This survey questionnaire is composed of 3 pages and completing the survey would take around 10 minutes.

The survey questionnaire is prepared in online format for the ease of participants. In the survey you can proceed to subsequent pages by clicking **FORWARD** and you can submit the responses by clicking **SUBMIT** at the end of the 3rd page.

I would like thank you in advance for your kind interest.

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Privacy policy:
1. The survey does not intend to gather information about people or companies. Therefore, there is no specific question about the name of the replier, company, or university. All data gathered from the survey will be maintained confidential and the responses will used only for academic research.
2. Participating in this survey is voluntary. If you complete the survey, you acknowledge that you participated in the survey voluntarily. Your rights will be protected under the applicable law.
3. There is no personal question in the survey that would cause personal inconvenience.
4. At the end of the survey, those who wish to be informed about the results of the survey can indicate their name and contact details. This information will definitely be used in any publication.

*** Fields where answers are obligatory**

QUESTIONS

***1. Your profession?**

☐ Architect
☐ Interior Designer
☐ Landscape Architect
☐ Mechanical Engineer
☐ Electrical Engineer
☐ Civil Engineer
☐ Other (Please specify):

***2. Your sector?**

☐ Public institutions
☐ Education / Research
☐ Investor Company
☐ Constructor
☐ Architectural Design Office
☐ Engineering Office
☐ Green Building Consulting Firm
☐ Material Production Company – Small constructors for specific materials
☐ Other (Please specify):

***3. For how long you have been in this profession?**

☐ Less than 1 year
☐ 1-5 years
☐ 6-10 years
☐ 11-20 years
☐ 21-30 years
☐ More than 30 years

***4. The city where you are working**

☐ İstanbul
☐ Ankara
☐ İzmir
☐ Other (Please specify):

***5. Education?**
☐ Undergraduate
☐ Graduate
☐ Ph.D.
☐ Other (Please specify):

***6. Please rank your knowledge about environmental / green / sustainable assessment tools (LEED, BREEAM vb.)**

☐ (5) I know the tools very well and assess buildings with tools
☐ (4) I know a good knowledge about the criteria of tools and the assessment process
☐ (3) I have a general knowledge about tools
☐ (2) I have a superficial knowledge about tools
☐ (1) I have no information about tools

***7. From which sources do you gain knowledge about tools?**
☐ Personal interest / research
☐ From clients
☐ Scientific researches
☐ TV or Newspaper
☐ Professional magazines / Internet sites
☐ During my education
☐ Workshops / Seminars
☐ Billboards / advertisements
☐ I have attended LEED or BREEAM certificates courses
☐ I worked on LEED or BREEAM certified project/s
☐ I am making a scientific research on this subject
☐ I have no information
☐ Other: …..

***8. Have you ever worked in a LEED or BREEAM certified/in process of certification project? (Except for existing buildings)**

☐ Yes (If the respondent says yes s/he continues with questions †) All the respondents answer to the last question: The definition of sustainable architecture

☐ No (If the respondent says yes s/he continues with questions ‡)

†*9. Can you specify your position in the project?

- ☐ Architectural design
- ☐ Static design
- ☐ Mechanical design
- ☐ Investor
- ☐ Constructor
- ☐ BREEAM/LEED assessor-consultant
- ☐ Energy modeling / consultant
- ☐ Acoustic modeling / consultant
- ☐ Coordinator of construction area
- ☐ Other (Please specify):

†*10. In which phase of the project was the decision of obtaining a certificate made?

- ☐ Before choosing construction site
- ☐ Conceptual design (Sketch plans)
- ☐ During conceptual design
- ☐ During technical / Production design
- ☐ After technical / production design
- ☐ Other (Please specify):

†*11. Please specify the level / degree that your project will/have receive?

- ☐ Outstanding
- ☐ Excellent
- ☐ Very Good
- ☐ Good
- ☐ Pass
- ☐ Platinum
- ☐ Gold
- ☐ Silver
- ☐ Certified

†*12. Please rank the reasons why the project aimed to receive a certification?

	Very important 5	Important 4	Middle 3	Somewhat important 2	Not important 1	No opinion
To gain market advantage / to be in the forefront						
Client request						
To demonstrate environment friendly practices						
Publicity value (selling buildings)						
Profit / economic reasons						
Social conscience						
Experimentation						
Local support from municipalities						

†*13. Please rank the contributions of tools for taking the followings decisions

	Very important 5	Important 4	Middle 3	Somewhat important 2	Not important 1	No opinion
Site selection						
Site plan						
Building/s orientation						
Building/s form (geometry, height…)						
Building zones						
Building façade design (windows, insulation, sealings…)						
Mechanical Systems (Energy efficient systems, lightening…)						
Landscape						
Material choices (Renewable materials, low impact…)						

†*14. Please rank the influences of the following design decision to reduce the energy consumption and CO_2 emission of your building

	Very important 5	Important 4	Middle 3	Somewhat important 2	Not important 1	No opinion
Meeting with occupants to discuss thermal comfort criteria						
Building/s orientation and geometry						
Passive systems (Building façade materials, windows, insulation, sealings, sun shades…)						
Active systems (Electrical and mechanical) efficient equipments						
Automatic control mechanisms (Building automation…)						
Electric production (Photovoltaic…)						
Purchase of renewable energy from grid						

Could you please indicate whether an innovative system is developed in your project? Please rank the influence of certification on the “design” of this system.

____

†*15. Please rank the problems you faced during the certification project.

	Very important 5	Important 4	Middle 3	Somewhat important 2	Not important 1	No opinion
Finding green building technical information						
Organizational problems in construction industry						
Lack of knowledge in minor constructors						
Finding green certified materials						
Finding high efficient mechanical equipment						
Communication problems in collaborative integrated design process						
Integrating environmental and financial performance assessments into design process						
The requirement of preparing many documents						

†*16. Please assess the following arguments.

	Strongly agree 5	4	3	2	Strongly disagree 1	No opinion
Certification tools enable integrated design process						
Certification tools can be thought as design guidelines						
Certification tools changes “the main architectural design decisions”						
Certification tools attribute more role to engineers than architects						
Building occupants must have a word in design decisions						
As the certificate criteria are independent from each other as a checklist, this might hamper holistic thinking in designing						
If a project gains some of the credits from certificate, it is a green building						
Certification tools helps us to understand local requirements and prospects and enable us to integrate them into design						
Augmentation in the number of certified buildings will direct the						

building industry into a sustainable path.						

†*17. Please assess the following arguments for your thoughts after the use of these tools.

	Strongly agree 5	4	3	2	Strongly disagree 1	No opinion
My thoughts about sustainable lifestyle have been totally altered						
It will have an important role for making decisions for new projects						
I would recommend new clients in certifying their buildings						

(THOSE WHO ANSWERED QUESTION 8 **NO** CONTINUE WITH THE FOLLLOWING QUESTIONS.)

‡*9. In your opinion in which phase of the project must decisions regarding sustainability be taken?

- ☐ Before choosing the construction site
- ☐ Conceptual design (Sketch plans)
- ☐ During conceptual design
- ☐ During technical / Production design
- ☐ After technical / production design
- ☐ Other (Please specify):

‡*10. In your opinion what would be the influence of tools while taking the followings decisions

	Very important 5	Important 4	Middle 3	Somewhat important 2	Not important 1	No opinion
Site selection						
Site plan						
Building/s orientation						
Building/s form (geometry, height…)						
Building zones						
Building façade design (windows, insulation, sealings…)						
Mechanical Systems (Energy efficient systems, lightening…)						
Landscape						
Material choices (Renewable materials, low impact…)						

‡*11. Please rank the reasons why a project should aim to receive a certification?

	Very important 5	Important 4	Middle 3	Somewhat important 2	Not important 1	No opinion
To gain market advantage / to be in forefront						
Client request						
To demonstrate environment friendly practices						
Publicity value (selling buildings)						
Profit / economic reasons						
Social conscience						
Regulator initiative / support						
Experimentation						
Local support from municipalities						

‡*12. Please assess the following arguments.

	Strongly agree 5	4	3	2	Strongly disagree 1	No opinion
Certification tools change “the main architectural design decisions”						
Certification tools enable integrated design process						
Certification tools can be thought as design guidelines						
Certification tools attribute more role to engineers than architects						
Building occupants must have a word in design decisions						
As the certificate criteria are independent from each other as a checklist, this might hamper holistic thinking						
If a project gains some of the credits from certificate, it is a green building						
Certification tools helps us to understand local requirements and prospects and enable us to integrate them into design						
Certification tools changes the understanding of sustainable lifestyle						
Augmentation in the number of certified buildings will direct the building industry into a sustainable path.						

COULD YOU PLEASE DEFINE A SUSTAINABLE BUILDING ACCORDING TO YOUR UNDERSTANDING?

____

WOULD YOU LIKE TO ADD ANY COMMENTS?

____

COMMUNICATION DETAILS: (PLEASE FILL IF YOU WOULD LIKE TO BE INFORMED ABOUT THE RESULTS OF THE SURVEY)__________

THANK YOU FOR YOUR RESPONSES.

Işıl RUHİ SİPAHİOĞLU

APPENDIX

A

APPENDIX 2

SURVEY RESULTS

This appendix presents the results of survey questions for which the study used only graphical representation or which are not discussed in the text of the study.

***6. Please rank your knowledge about environmental / green / sustainable assessment tools (LEED, BREEAM vb.)**

Ranking of knowledge about environmental / green / sustainable assessment tools (LEED, BREEAM vb.) (Group 1)	Number of Respondents
(5) I know the tools very well and assess buildings with tools	14
(4) I know a good knowledge about the criteria of tools and the assessment process	12
(3) I have a general knowledge about tools	-
(2) I have a superficial knowledge about tools	1
(1) I have no information about tools	-
TOTAL	**27**
Ranking of knowledge about environmental / green / sustainable assessment tools (LEED, BREEAM vb.) (Group 2)	
(5) I know the tools very well and assess buildings with tools	8
(4) I know a good knowledge about the criteria of tools and the assessment process	24
(3) I have a general knowledge about tools	34
(2) I have a superficial knowledge about tools	32
(1) I have no information about tools	8
TOTAL	**106**

***7. From which sources do you gain knowledge about tools?**

Sources from which the respondents gain knowledge about tools	Number of Respondents
Personal interest / research	59
From clients	8
Scientific researches	49
TV or Newspaper	10
Professional magazines / Internet sites	77
During my education	23
Workshops / Seminars	34
Billboards / advertisements	6
I have attended LEED or BREEAM certificates courses	28
I worked on LEED or BREEAM certified project/s	27
I am making a scientific research on tools	19

I have no information	7
Other	3
Other: I was informed by our green building consultant	
From my friends who are working on these projects	
My sister/brother is also an architect, who worked with LEED projects in US	

***8. Have you ever worked in a LEED or BREEAM certified/in process of certification project? (Except for existing buildings)**

	Number of Respondents
Yes (Group 1)	27
No (Group 2)	106
TOTAL	**133**

†*12. Please rank the reasons why the project aimed to receive a certification?

	Very important	Important	Middle	Somewhat important	Not important	No opinion	Number of responses
Why the project aimed to receive a certification							
To gain market advantage / to be in the forefront	16	7	-	-		1	24
Client request	3	10	4	3	1	1	22
To demonstrate environment friendly practices	8	8	6	2	3	-	27
Publicity value (selling buildings)	11	7	1	-	2	1	22
Profit / economic reasons	6	8	6	2	1	-	23
Social conscience	5	7	6	3	3	-	24
Experimentation	1	4	1	1	11	5	23
Local support from municipalities	-	3	2	2	13	3	23

†*13. Please rank the contributions of tools for taking the followings decisions.

†*14. Please rank the influences of the following design decision to reduce the energy consumption and CO_2 emission of your building.

	Very important	Important	Middle	Somewhat important	Not important	No opinion	Number of responses
The contributions of tools in the followings decisions							
Site selection	-	2	6	3	12	1	24
Site plan	-	6	9	4	4	-	23
Building/s orientation	4	5	7	7	1	-	24
Building/s form (geometry, height…)	3	8	9	1	2	-	23
Building zones	4	6	9	2	3	-	24
Building façade design (windows, insulation, sealings…)	13	9	4	-	-	-	26
Mechanical Systems (Energy efficient systems, lightening…)	19	3	3	1	-	-	26
Landscape	8	9	6	1	-	-	24
Material choices (Renewable materials, low impact…)	11	6	8	1	-	-	26
The influences of the following design decision to reduce the energy consumption and CO2 emission							
Meeting with occupants to discuss thermal comfort criteria	-	8	7	5	5	-	25
Building/s orientation and geometry	6	13	5	3	-	-	27
Passive systems (Building façade	13	8	3	2	-	-	26
Active systems (Electrical and mechanical) efficient equipments	20	5	2	-	-	-	27
Automatic control mechanisms (Building automation…)	15	10	2	-	-	-	27
Electric production (Photovoltaic…)	9	8	3	6	-	-	26
Purchase of renewable energy from grid	5	7	1	8	4	-	25

†*15. Please rank the problems you faced during the certification project.

	Very important	Important	Middle	Somewhat important	Not important	No opinion	Number of responses
The problems faced during the certification process							
Finding green building technical information	-	6	8	6	5	-	25
Organizational problems in construction industry	1	7	12	3	1	1	25
Lack of knowledge in minor constructors	5	5	12	3	-	-	25
Finding green certified materials	5	9	5	4	2	-	25
Finding high efficient mechanical equipments	2	4	5	10	5	-	26
Communication problems in collaborative integrated design process	-	7	11	4	4	-	26
Integrating environmental and financial performance assessments into design process	2	6	12	3	3	-	26
The requirement of preparing many documents	3	6	12	3	3	-	27

†*16. Please assess the following arguments.

†*17. Please assess the following arguments for your thoughts after the use of these tools.

	Strongly agree (5)	Agree (4)	Neither agree nor disagree (3)	Disagree (2)	Strongly disagree (1)	No opinion	Number of responses
Certification tools enable integrated design process	15	7	3	-	2	-	27
Certification tools can be thought as design guidelines	9	10	5	1	2	-	27
Certification tools changes “the main architectural design decisions”	8	5	10	3	1	-	27
Certification tools attribute more role to engineers than architects	3	5	10	3	1	-	22
Building occupants must have a word in design decisions	8	6	8	5	-	-	27
As the certificate criteria are independent from each other as a checklist, this might hamper holistic	1	4	4	11	6	-	26
If a project gains some of the credits from certificate, it is a green building	2	7	9	4	4	-	26
Certification tools helps us to understand local requirements and prospects and enable us to integrate them into design	2	8	6	5	5	-	26
Augmentation in the number of certified buildings will direct the building industry into a sustainable path.	8	12	4	1	1	-	26
Thoughts after the use of these tools							
My thoughts about sustainable lifestyle have been totally altered	7	6	8	3	2	-	26
It will have an important role for making decisions for new projects	7	9	7	1	2	1	27
I would recommend new clients in certifying their buildings	9	9	5	1	1	-	

‡*10. In your opinion what would be the influence of tools while taking the followings decisions

	Very important	Important	Middle	Somewhat important	Not important	No opinion	Number of responses
What would be the contributions of tools in the followings decisions							
Site selection	16	22	18	26	20	1	103
Site plan	26	38	21	14	5	1	105
Building/s orientation	48	29	22	5	1	1	106
Building/s form (geometry, height…)	34	38	23	6	3	1	105
Building zones	27	31	31	5	2	4	100
Building façade design (windows, insulation, sealings…)	58	34	8	4	-	2	106
Mechanical Systems (Energy efficient systems, lightening…)	55	42	7	-	-	1	105
Landscape	17	36	37	13	2	1	106
Material choices (Renewable materials, low impact…)	48	28	20	8	1	1	106

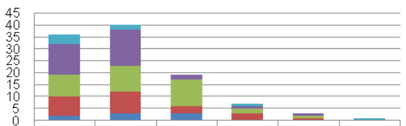
‡*11. Please rank the reasons why a project should aim to receive a certification?

	Very important	Important	Middle	Somewhat important	Not important	No opinion	Number of responses
Ranking of the reasons why a project should aim to receive a certification							
To gain market advantage / to be in the forefront	24	43	20	9	9	1	106
Client request	21	51	19	8	3	1	103
To demonstrate environment friendly practices	58	26	14	5	1	1	105
Publicity value (selling buildings)	22	50	21	8	3	2	106
Profit / economic reasons	43	42	15	2	2	1	105
Social conscience	41	34	21	4	4	1	105
Experimentation	4	7	30	33	25	6	105
Local support from municipalities	33	30	24	9	7	3	106

‡*12. Please assess the following arguments.

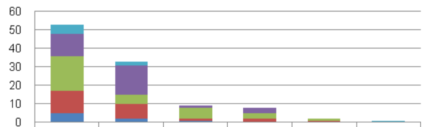
The answers to these questions are examined based on the knowledge of the respondent on these tools and are represented in the following figures. The graphics are prepared according to the number of responses.

Certification tools change “the main architectural design decisions” / Knowledge



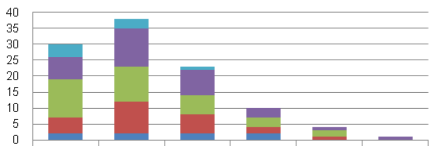
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	4	2	0	1	0	1
2 Knowledge	13	15	2	1	1	0
3 Knowledge	9	11	11	2	1	0
4 Knowledge	8	9	3	3	1	0
5 Knowledge	2	3	3	0	0	0

Certification tools enable integrated design process / Knowledge



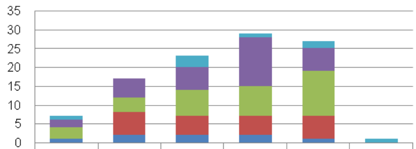
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	5	2	0	0	0	1
2 Knowledge	12	16	1	3	0	0
3 Knowledge	19	5	6	3	1	0
4 Knowledge	12	8	1	2	1	0
5 Knowledge	5	2	1	0	0	0

Certification tools can be thought as design guidelines / Knowledge



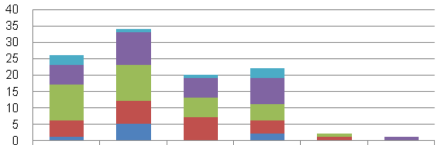
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	4	3	1	0	0	0
2 Knowledge	7	12	8	3	1	1
3 Knowledge	12	11	6	3	2	0
4 Knowledge	5	10	6	2	1	0
5 Knowledge	2	2	2	2	0	0

Certification tools attribute more role to engineers than architects / Knowledge



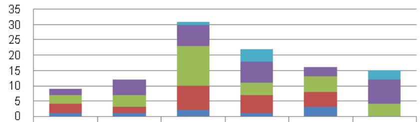
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	1	0	3	1	2	1
2 Knowledge	2	5	6	13	6	0
3 Knowledge	3	4	7	8	12	0
4 Knowledge	0	6	5	5	6	0
5 Knowledge	1	2	2	2	1	0

Building occupants must have a word in design decisions / Knowledge



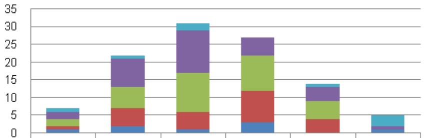
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	3	1	1	3	0	0
2 Knowledge	6	10	6	8	0	1
3 Knowledge	11	11	6	5	1	0
4 Knowledge	5	7	7	4	1	0
5 Knowledge	1	5	0	2	0	0

As the certificate criteria are independent from each other as a checklist, this might hamper holistic thinking / Knowledge



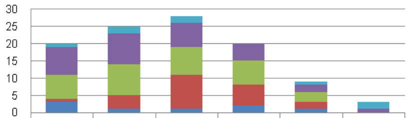
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	0	0	1	4	0	3
2 Knowledge	2	5	7	7	3	8
3 Knowledge	3	4	13	4	5	4
4 Knowledge	3	2	8	6	5	0
5 Knowledge	1	1	2	1	3	0

If a project gains some of the credits from certificate, it is a green building / Knowledge



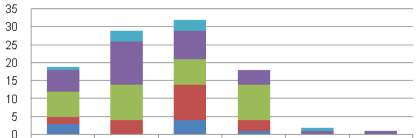
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	1	1	2	0	1	3
2 Knowledge	2	8	12	5	4	1
3 Knowledge	2	6	11	10	5	0
4 Knowledge	1	5	5	9	4	0
5 Knowledge	1	2	1	3	0	1

Certification tools helps us to understand local requirements and prospects and enable us to integrate them into design / Knowledge



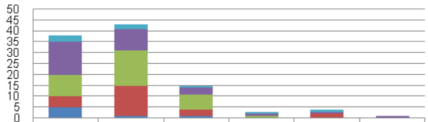
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	1	2	2	0	1	2
2 Knowledge	8	9	7	5	2	1
3 Knowledge	7	9	8	7	3	0
4 Knowledge	1	4	10	6	2	0
5 Knowledge	3	1	1	2	1	0

Certification tools changes the understanding of sustainable lifestyle / Knowledge



	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	1	3	3	0	1	0
2 Knowledge	6	12	8	4	1	1
3 Knowledge	7	10	7	10	0	0
4 Knowledge	2	4	10	3	0	0
5 Knowledge	3	0	4	1	0	0

Augmentation in the number of certified buildings will direct the building industry into a sustainable path / Knowledge



	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	No opinion
1 Knowledge	3	2	1	1	1	0
2 Knowledge	15	10	3	1	1	1
3 Knowledge	10	16	7	1	0	0
4 Knowledge	5	14	3	0	2	0
5 Knowledge	5	1	1	0	0	0

COULD YOU PLEASE DEFINE A SUSTAINABLE BUILDING ACCORDING TO YOUR UNDERSTANDING?

The author of this study translated the definitions given by professionals who worked with tools. The following table shares these definitions along with the personal characteristics of the respondents.

	Profession	Experience year	Education	Sector	The definition of sustainable building
1	Architect	6-10	Ph.D.	Project management company	I will share the definition of sustainable building that I like the most and that explains my point of view: “Sustainable construction is the set of processes by which a profitable and competitive industry delivers built assets (buildings, structures, supporting infrastructure and their immediate surroundings) which • enhance quality of life and offer customer satisfaction • offer flexibility and the potential to cater for user changes in the future; • provide and support desirable natural and social environments • maximize the efficient use of resources.” Raynsford, N., 2000. Sustainable construction: the Government’s role, Proceedings of ICE, Vol. 138, pp. 16.
2	Architect	11-20	Ph.D.	Archi. Des. Of.	Ecological buildings are energy efficient, do not have harmful effects on nature, maximizes occupant comfort, produces its own energy, value the use of recyclable materials, and are healthy.
3	Architect	21-30	Undergraduate	Archi. Des. Of.	A building that is designed actually taking into account the basic architectural principles, while using nature (daylight, wind, rain) or taking precautions against the negative effects of nature.
4	Mechanical Engineer	11-20	Undergraduate	Mech. Des. Of.	A building that can produce its own energy, consumes minimum energy, by using the infinite energy of soil, water, sun and wind, is respectful and compatible to its surrounding and nature; provides and maintains the required comfort level, and can be intelligently managed through automation.
5	Architect	6-10	Graduate	Archi. Des. Of. + Green Building consultant office	A building that is designed according to its location, with its materials, by considering all the criteria and that can be efficiently and effectively used by the occupants throughout its lifetime

6	Architect	21-30	Graduate	Architectural Design Office	Buildings that are designed by considering the environmental data; can become compatible with its 'local area;' are respectful to human health; have as much as long lifetime; use technology with all its constituents with respect to environmental factors. These building are "living organisms," when their lifetime end they can be part of the environment.
7	Architect	21-30	Undergraduate	Archi. Des. Of.	Sustainable building is a building that do harm as less as possible to nature, when constructed and while being used.
8	Quality manager	11-20	Undergraduate	Developer + constructor firm	Buildings are living environments designed based on the right decisions about the choice of site, environmental factors, social structure, consumption of resources; they are constructed for leaving a clean and healthy world for future generations.
9	Architect	6-10	Graduate	Deve.oper + constructor firm	Building that do less harm to nature and that provide healthy and comfortable spaces during the construction and the use phase.
10	Mechanical eng	11-20	Graduate	Developer firm	Buildings that elevate the life quality and comfort; uses natural and recycle material; consumes low energy; produce their required energy on their own.
11	Mechanical engineer	21-30	Ph.D.	Mech. Des. Of. + Green Bui. consultant office	Building that meets the IEQ comfort criteria, and that requires low energy and water. With respect to normal building they require 5-10% more initial cost, return investment must be intended in 5 years.
12	City planner	11-20	Graduate	Green Building consultant office	Named as green, sustainable, ecological or environmental friendly, these building are compatible with nature. Starting from the evaluation of the choice of site, buildings designed with a holistic and socio-environmental approach that considers the whole life-cycle of the building. Designed according to the characteristics of the climate and the particular characteristics of the place. Buildings that consumes according to its requirement, that use renewable energy, that do no harm human health, that use materials which do not produce waste that uses natural materials, that are sensible to the ecosystem.
13	Architect	21-30	Ph.D.	Architectural Design Office	Through the help of new technologies, attaining the efficiency in the use of natural sources and enabling the cultural survival…
14	Architect	11-20	Graduate	Architectural Design Office	Buildings that aims at attaining long term environmental and economic benefits through the establishment of design criteria.

15	Civil engineer	6-10	Graduate	Green Building consultant office	Buildings that do not harm nature and therefore buildings that does not obstruct the future generations. It is not possible to design sustainable building with current production techniques.
16	Architect	11-20	Ph.D.	Education + Green Building consultant office	Building that considers the environmental exigencies and the requirements of humans as much as it considers the financial targets.

A

APPENDIX 3

CASE STUDY A OFFICE BUILDING IN AYDIN: PROJECT DRAWINGS

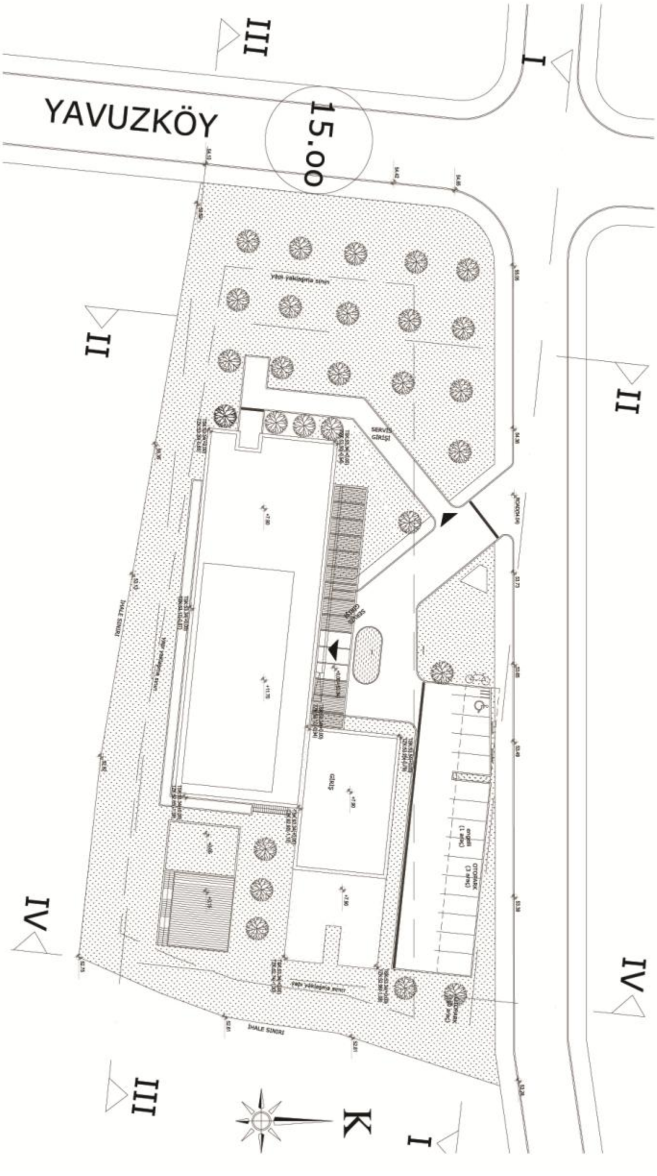


Fig. Appendix 3.1: Case study A Site Plan

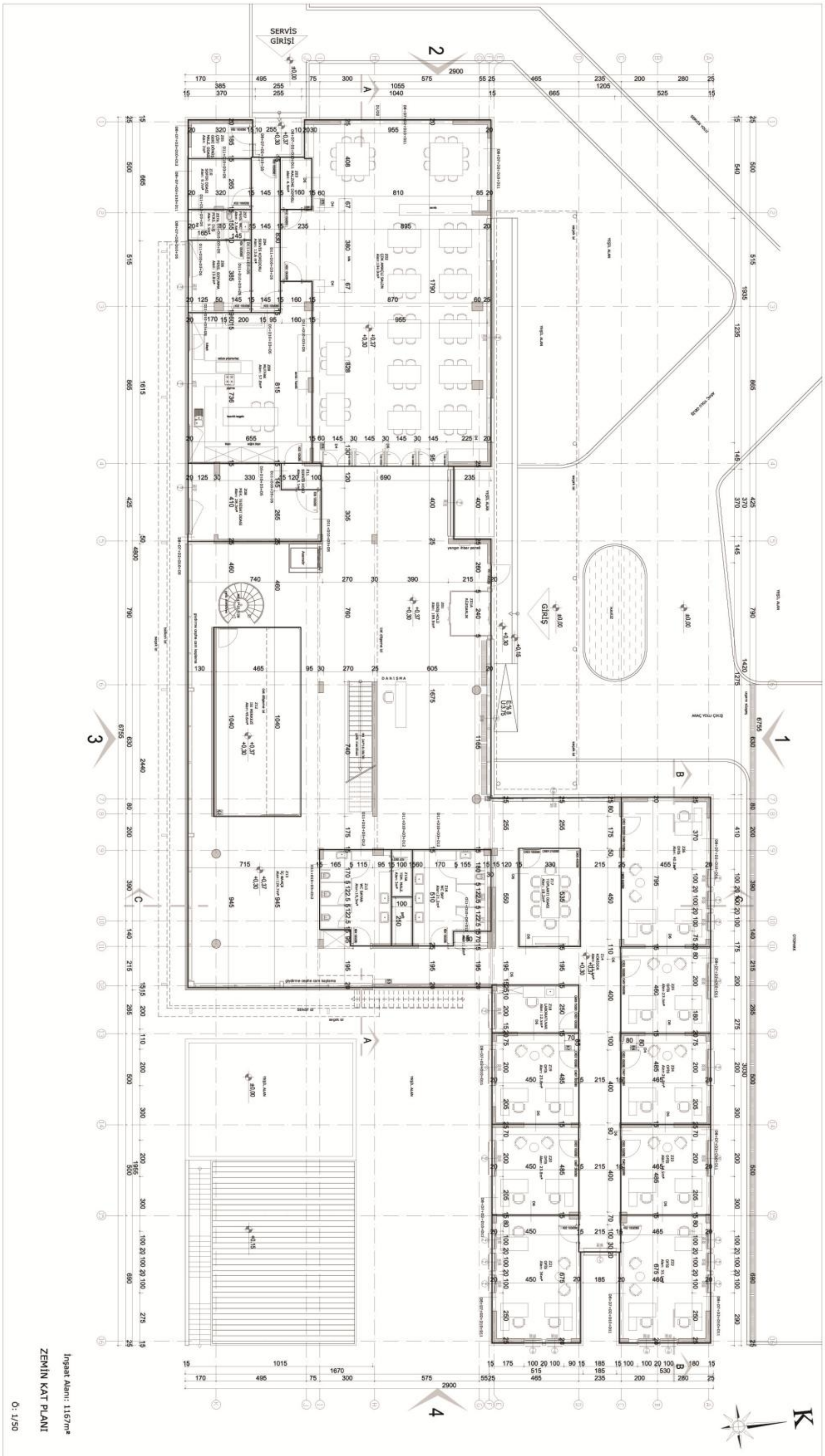


Fig. Appendix 3. 2: Case study A Ground Floor Plan

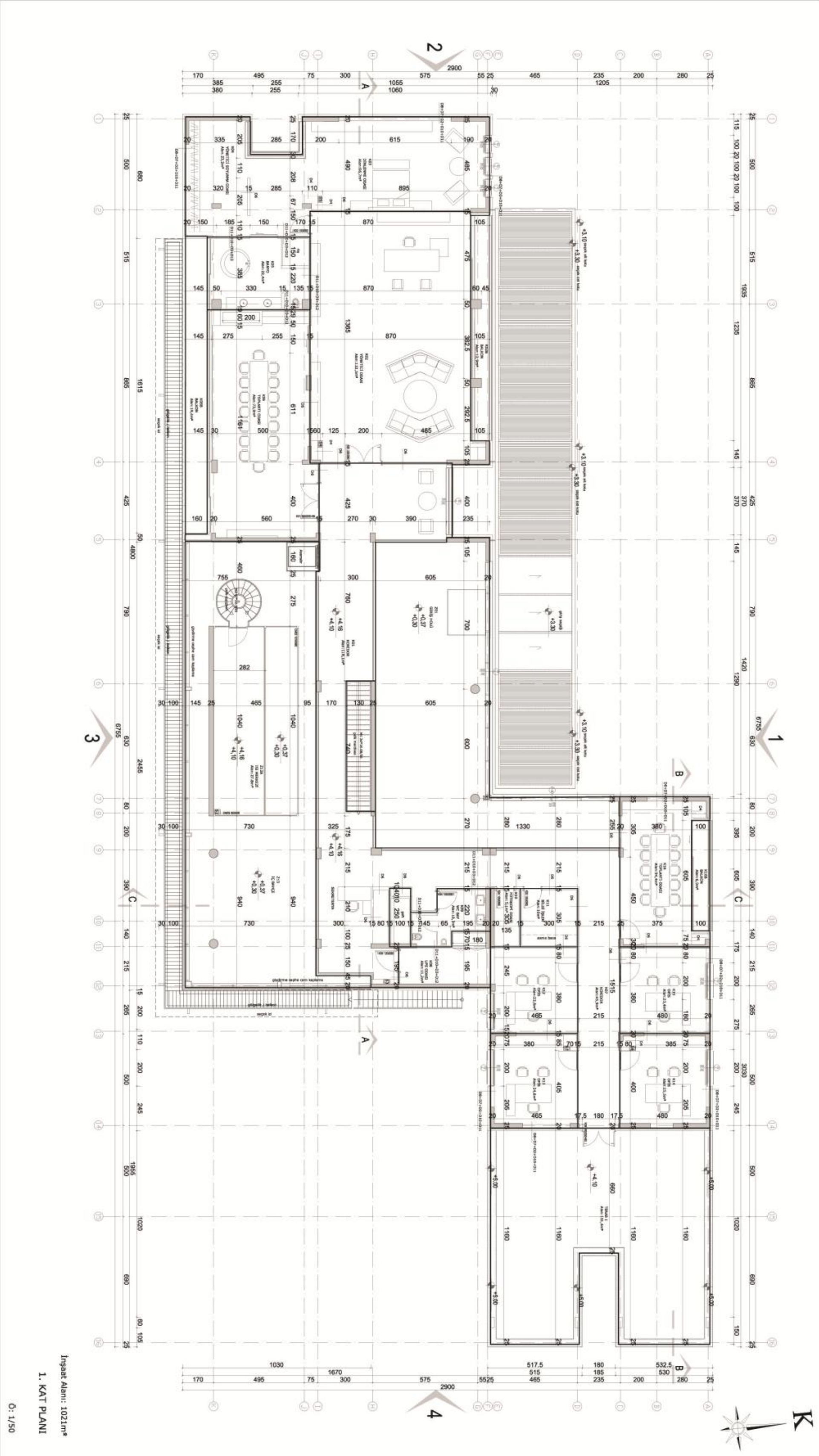


Fig. Appendix 3. 3: Case study A Ground Floor Plan

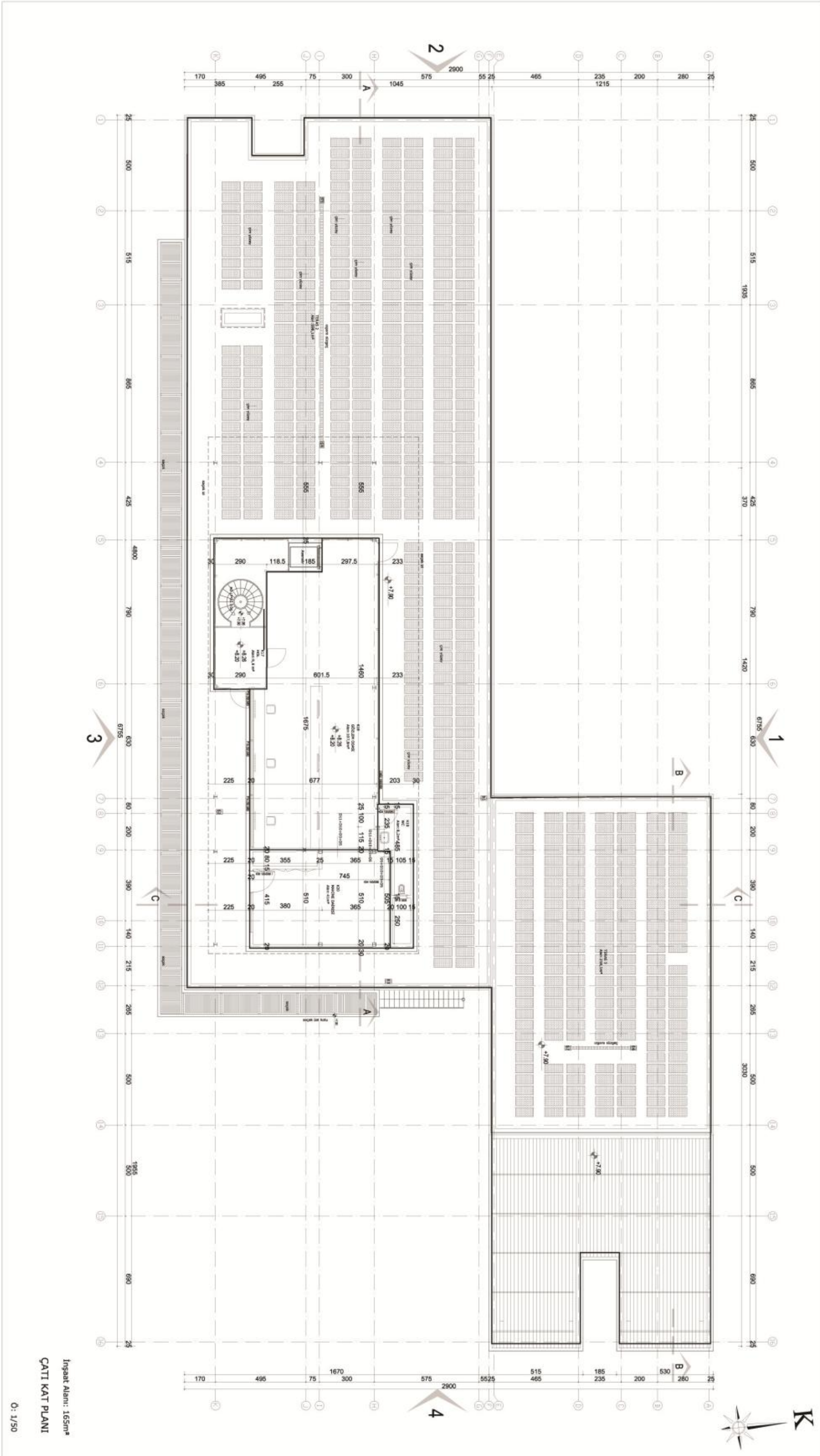
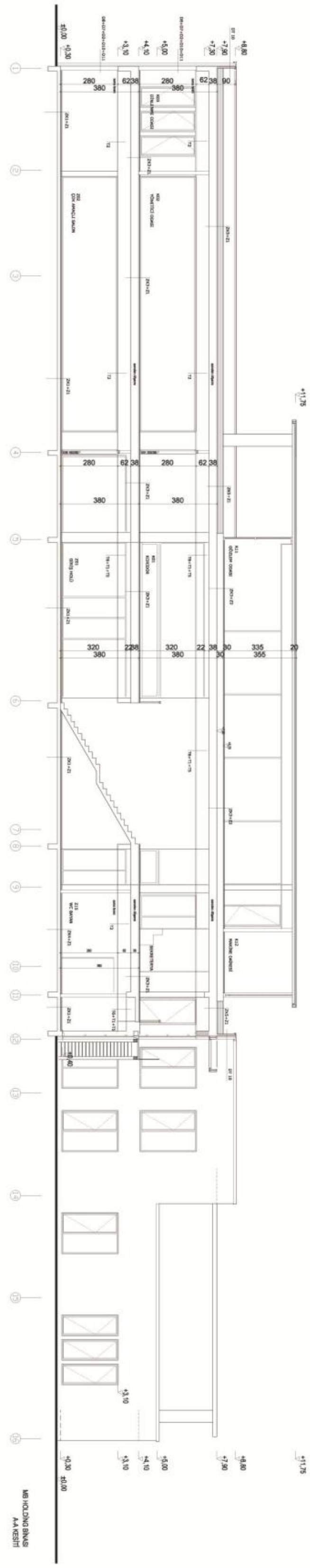


Fig. Appendix 3. 4: Case study A Roof plan



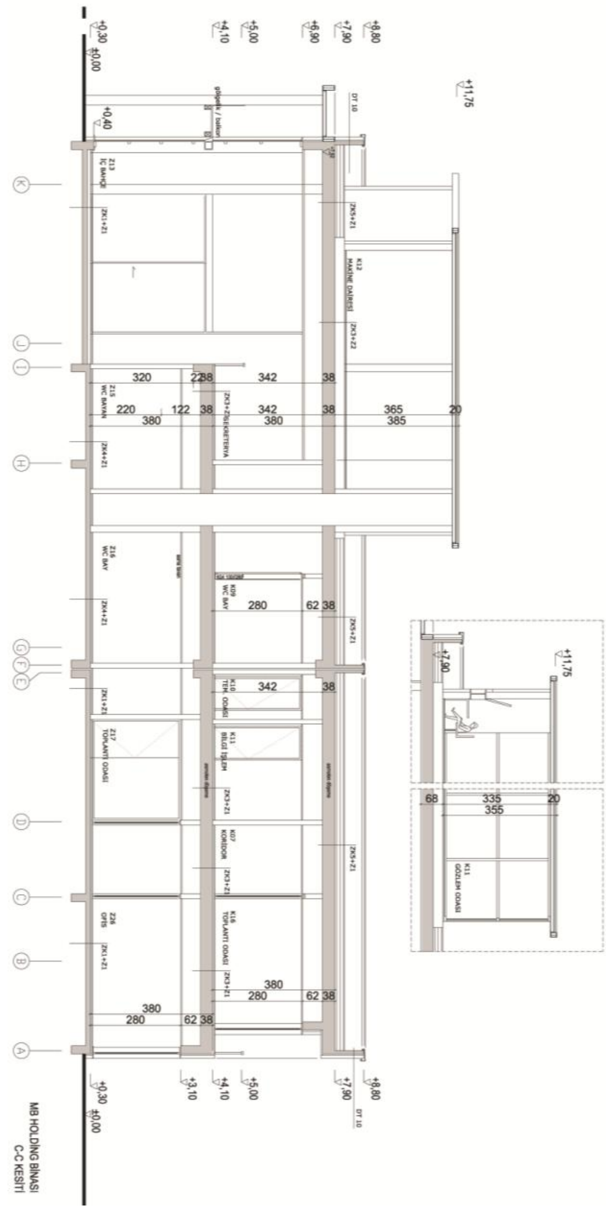


Fig. Appendix 3. 5: Case study A AA Section (Left)
Fig. Appendix 3. 6: CC Section (Right)

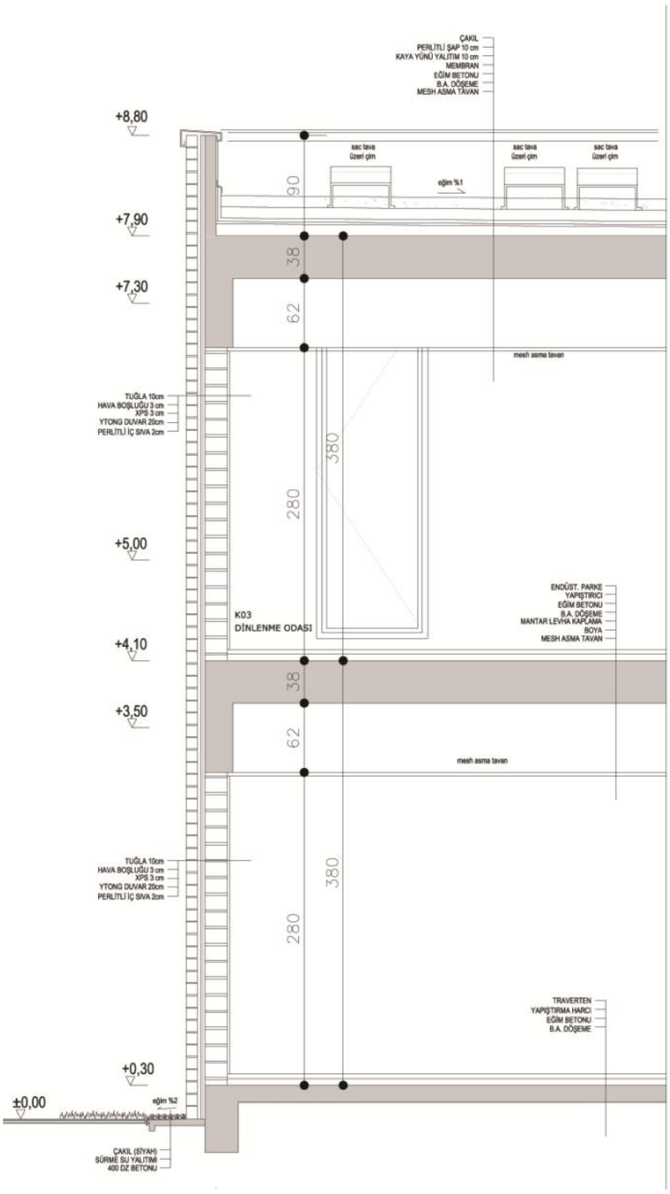


Fig. Appendix 3. 7: Case study A System detail (On the roof it is seen the roof pans for green roof)

CASE STUDY B FRITERM FACTORY AND OFFICE BUILDING: PROJECT DRAWINGS

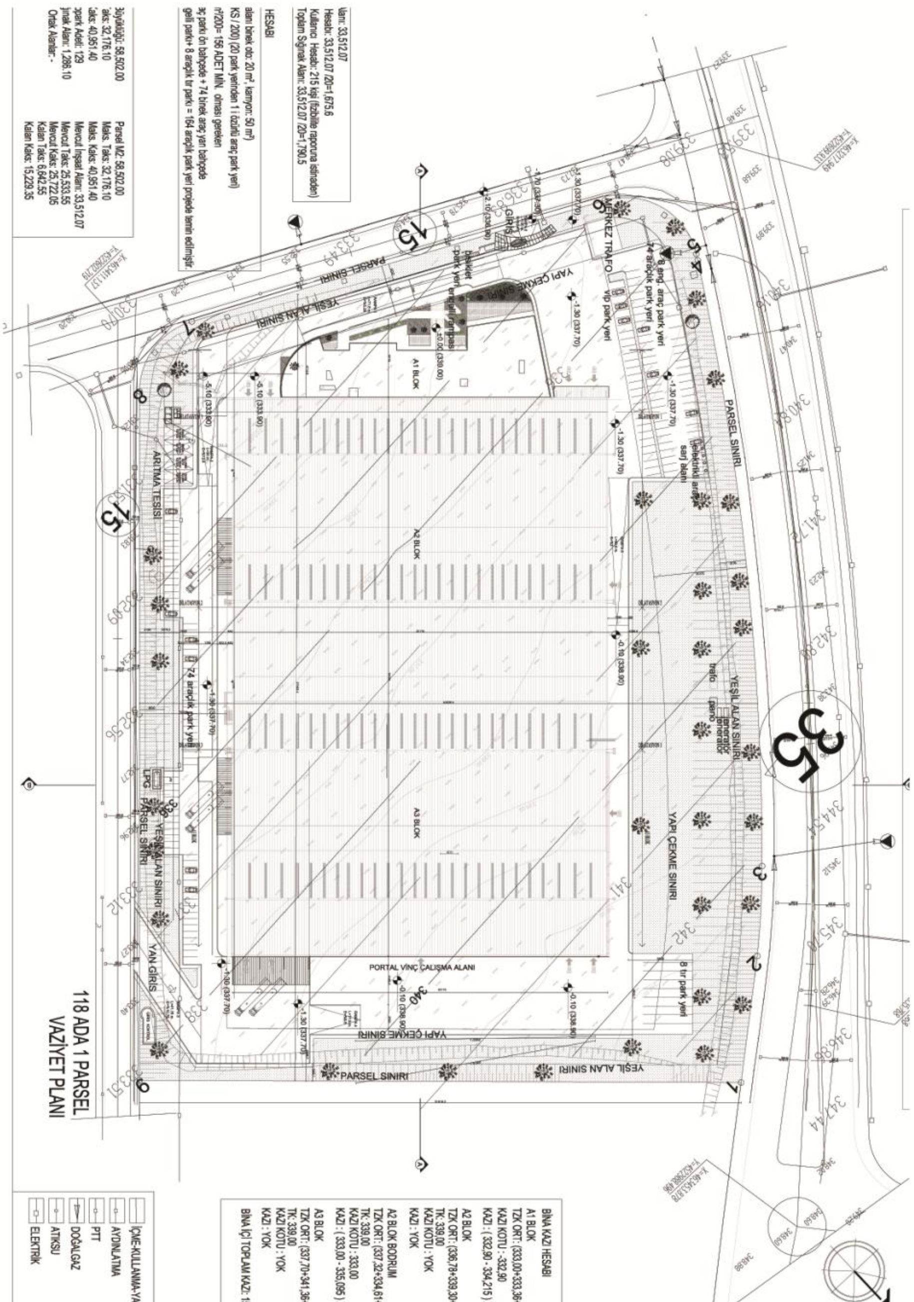


Fig. Appendix 3. 8: Case study B Site Plan

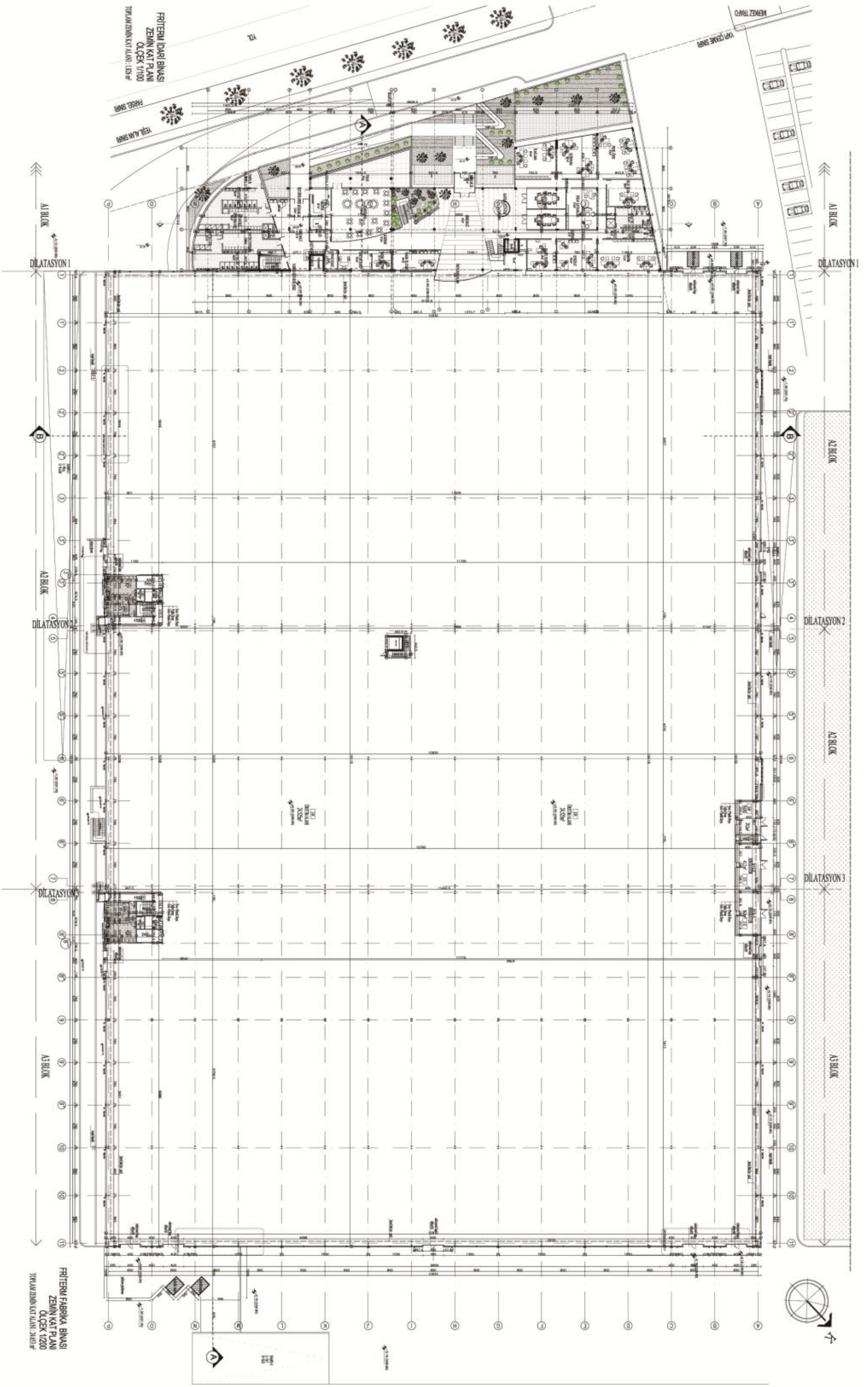


Fig. Appendix 3. 9: Case study B Ground Floor Plan

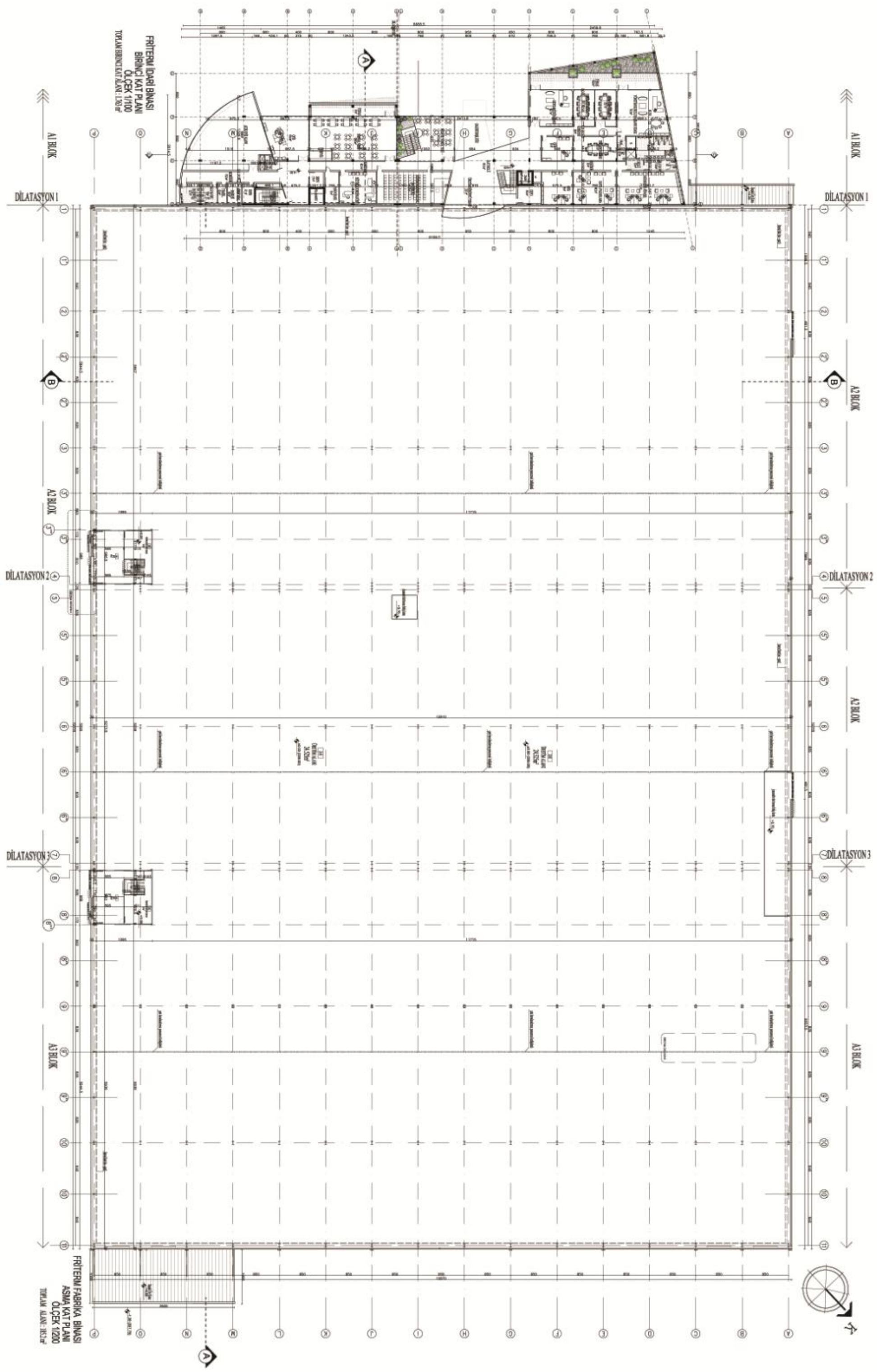


Fig. Appendix 3.10: Case study B, First Floor Plan

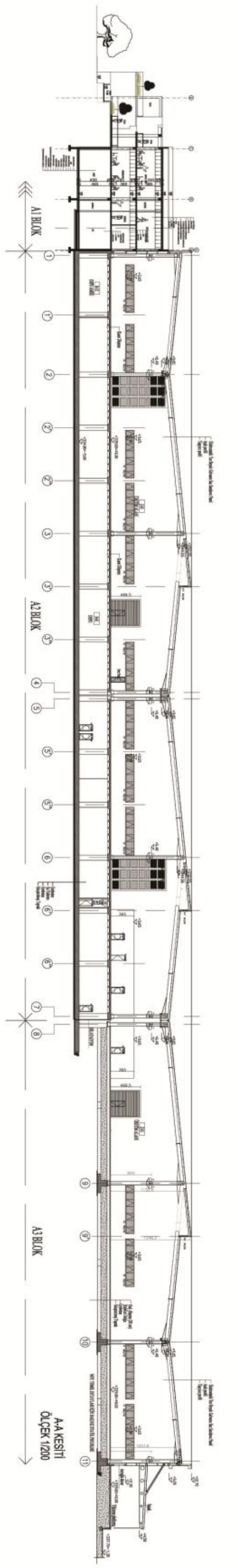


Fig. Appendix 3.11: Case study B, Section AA (Left)
Fig. Appendix 3.12: Case study B, Front view (Right)